

# OPERATION and MAINTENANCE MANUAL

for

## MODEL PV-30208

30 kW Grid-Tied Photovoltaic Inverter

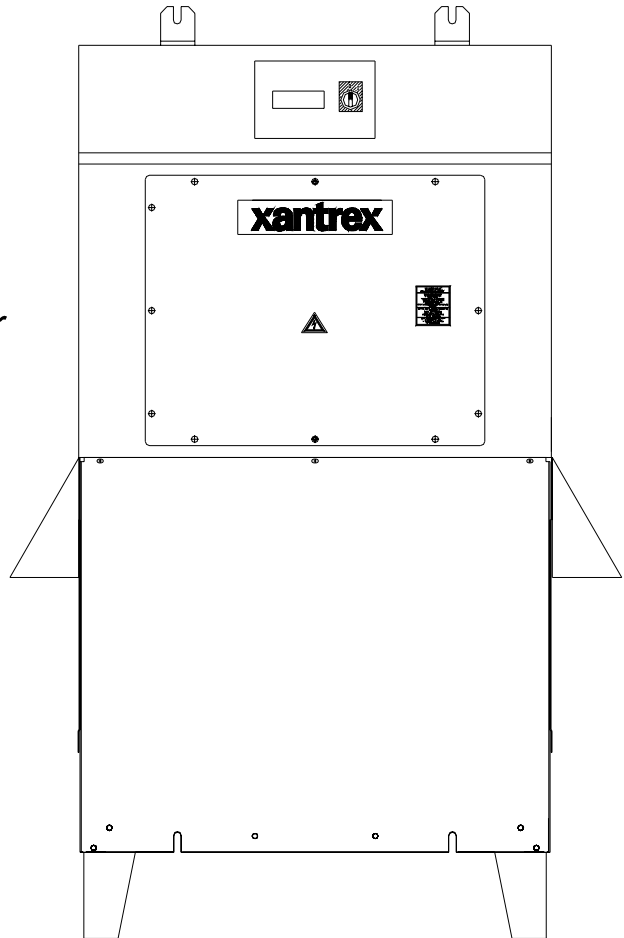
# xantrex

*Smart Choice for Power*



Document #151315

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### IMPORTANT SAFETY INSTRUCTIONS

**SAVE THESE INSTRUCTIONS** - THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS FOR XANTREX TECHNOLOGY MODEL PV-30208 GRID TIED PHOTOVOLTAIC INVERTER THAT SHALL BE FOLLOWED DURING INSTALLATION AND MAINTENANCE OF THE PV-30208.

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# Table of Contents

<b>Product Description</b> .....	<b>Section 1</b>
Introduction .....	1-1
Major Components .....	1-1
Interconnection Standards Compliance .....	1-2
Specifications .....	1-3
Equipment Symbol .....	1-3
<b>Safety</b> .....	<b>Section 2</b>
Safety Features .....	2-1
Isolation Procedure .....	2-2
<b>Installation And Initial Turn-On</b> .....	<b>Section 3</b>
Isolation Transformer Requirements .....	3-1
Torque and Wire Gauge Specifications .....	3-1
Installation Instructions .....	3-2
Interconnection Wiring .....	3-4
Initial Turn On Procedure .....	3-7
<b>Operation</b> .....	<b>Section 4</b>
Description of System Operation .....	4-1
Operation Features .....	4-2
Operator Interface Panel (LCD) .....	4-5
Example of Normal System Operation .....	4-6
System Operating Parameters .....	4-7
<b>Troubleshooting</b> .....	<b>Section 5</b>
General .....	5-1
Fault Conditions .....	5-1
Fault Descriptions and Troubleshooting .....	5-2
<b>Preventative Maintenance</b> .....	<b>Section 6</b>
Periodic Maintenance .....	6-1
Isolation Procedure .....	6-1
Turn-On Procedure .....	6-2
<b>Appendix</b> .....	<b>Section 7</b>
Drawings List .....	7-1
Warranty and Certifications .....	7-1
Optional Accessories .....	7-1

**INTRODUCTION**

The Xantrex Technology Model PV-30208 is a 30 kW Grid Tied Photovoltaic Inverter. It utilizes advanced power electronics to allow the interface of a photovoltaic array with an utility grid. The PV-30208 is a highly integrated assembly, consisting of an inverter bridge and associated control electronics. The PV-30208 control software provides for complete overall system control with the required protective and safety features.

**MAJOR COMPONENTS**

The major components of the PV-30208 are identified in Drawing No. 151317.

**Main Enclosure**

The enclosure (shown in Figure 1-1) is NEMA-3R rated. The PV-30208 enclosure contains the solar control bus board, output line filter (insuring that the PV-30208 line currents meet IEEE-519 harmonic distortion requirements), control power transformers, and A/C contactor. The upper enclosure contains the operator interface panel ( LCD and an on/off switch).

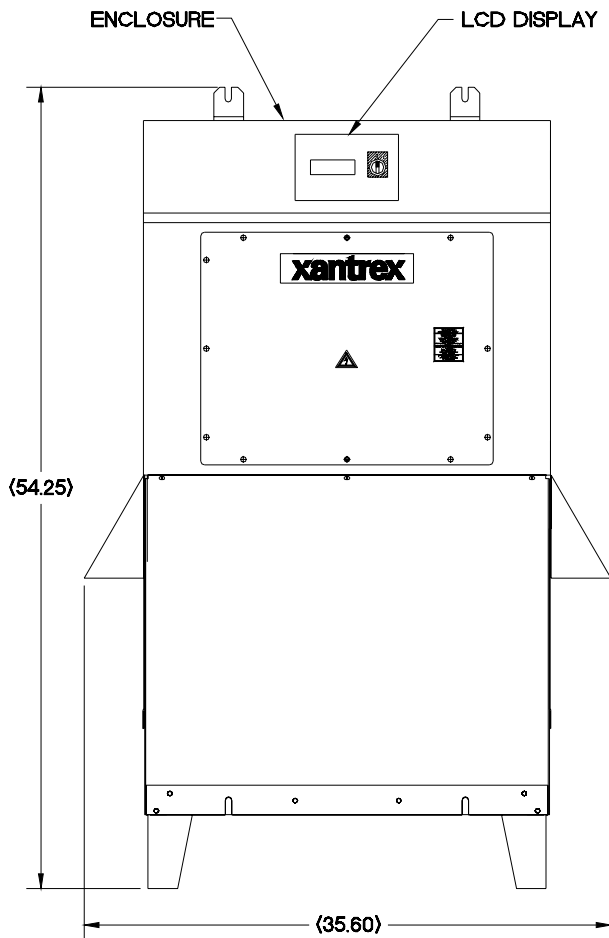


Figure 1-1

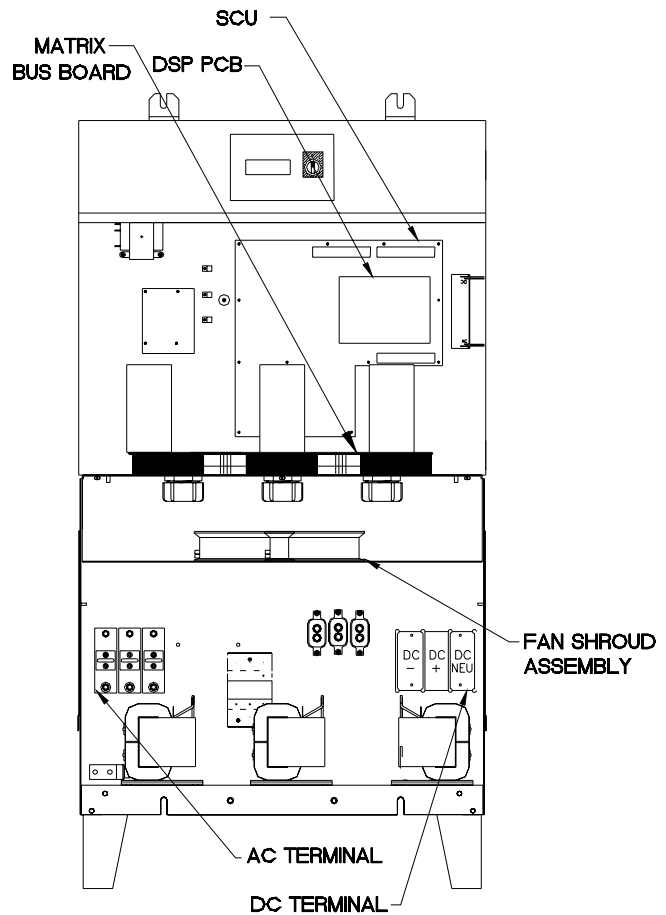


Figure 1-2

**CAUTION**

The fuses within the PV-30208 are intended for protecting the PV-30208 control circuitry only. They are not intended to provide protection for the PV array or external cabling.

**Matrix Bus Board**

The PV-30208 design makes use of a fully integrated matrix bus board as shown in **Figure 1-2**. The bus board assembly is mounted to an aluminum extrusion heatsink, which is mounted between the upper and lower enclosures. The power electronics is comprised of a three, dual pack IGBT devices, mounted to the heatsink. The bus board is mounted on top of the IGBT dual pack devices, which is supported through a series of standoffs attached to the heatsink.

**Solar Control Unit (SCU)**

The SCU consists of an integrated modulator board and a DSP control board. The modulator board contains isolated closed loop IGBT PWM drive circuits, A/C and D/C high voltage measurement circuits, A/C, D/C and ground current regulation and measurement circuits, A/C contactor controls, and binary I/O circuitry.

**DSP**

The DSP board interfaces to the modulator board through a PC104 interface bus. The DSP board is designed to the industry standard PC-104 specification, and is used to perform the majority of the calculations needed to control the bus board. The most significant tasks are: control of PV-30208 electromechanical components and power electronics converters, signal conditioning (digital filtering and transformations), and communication with the operator interface panel and system sensors.



**SCU & DSP**

**INTERCONNECTION STANDARDS COMPLIANCE**

The PV-30208 has been tested and certified by Underwriters Laboratories to be in compliance with **UL1741 Static Inverters And Charge Controllers For Use In Photovoltaic Power Systems**, as well as **IEEE-929-2000 Recommended Practice For Utility Interface Of Photovoltaic (PV) Systems**.

IEEE-929-2000 provides guidance regarding equipment and functions necessary to ensure compatible operation of photovoltaic systems which are connected in parallel with the electric utility. UL1741 is the test procedure performed by Underwriters Laboratory on the PV-30208 to verify it meets the recommendations of IEEE-929-2000. Refer to both documents for details of these recommendations and test procedures.

**SPECIFICATIONS**

The PV-30208 has been designed for photovoltaic power systems, which operate within the following specifications. Application of the PV-30208 in a manner inconsistent with these specifications may cause damage to the PV-30208 and other system components, and is a violation of the terms of the warranty.

Nominal AC Line Voltage	208 VAC, +10% -12%
Maximum AC Line Current	94 ARMS (at low line voltage)
Nominal Line Frequency	60 Hz, +0.5 Hz -0.7 Hz
Continuous AC Output Power	30.0 KW @ 208 VAC 3 Phase
PV Maximum Voltage	600 VDC
Peak Power Tracking Window	330*-600 VDC
PV Minimum Peak Power Tracking Voltage	330
PV Maximum Current	100 ADC
PV Maximum Array Short Circuit Current	138 ADC
PV Configuration	Monopolar negative grounded, or bi-polar neutral ground
Operating Temperature	** -20 to 50° C
Storage Temperature	-40 to 50° C
Maximum Ambient Temperature Rating	50° C
Relative Humidity	To 95%, Non-condensing
Elevation	Derated above 6,600 feet
Dimensions (in inches)	54.5 X 35.6 X 19
Weight	Approx. 260 lbs.
Enclosure Type	NEMA 3R
UL Listing File	File-E199356

\*Dependent on actual AC line voltage. Refer to Section 4 for detail on the minimum power tracking voltage.

\*\*If ambient temperature is between -20 to 0° C, the unit must be powered up in standby for at least one hour prior to going on-line.

**EQUIPMENT SYMBOL**

Chassis ground – Customer supplied system ground connection point. This symbol may be found near a stud within the main enclosure. It is provided as a location to bond the electrical system equipment ground.



## SAFETY FEATURES

### WARNING

**The PV-30208 enclosure contains exposed high voltage conductors. The upper enclosure access panel should remain closed, except during maintenance or testing. These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that specified in the operating instructions unless you are qualified to do so. Do not remove the front access panel if extreme moisture is present (rain or heavy dew).**

### On/Off Switch

The PV-30208 incorporates a maintained position on/off switch located on the upper enclosure. Under normal conditions, the on/off switch is in the on position. Turning the switch to the off position will initiate a controlled shutdown of the PV-30208 and open the A/C contactor within the unit. The A/C contactor cannot be closed unless the switch is in the on position. The PV-30208 is prevented from being restarted until the on/off switch is turned back to the on position. Cycling the on/off switch will reset the PV-30208 and attempt to clear any system fault.

### Enclosure Front Access Panel

The front access panel of the PV-30208 upper enclosure is fastened with twelve M6 stainless steel hex nuts. It is required that the PV-30208 enclosure front panel be securely fastened during normal operation.

### WARNING

**The PV-30208 does not incorporate a door interlock switch. Please make sure the unit is powered down, and isolated from the utility grid and PV panels, prior to opening the front access panel. Allow 5 minutes for any stored potentials to be discharged prior to opening the unit. The front access panel of the PV-30208 upper enclosure must be securely fastened during normal operation.**

### Fault Reporting

Fault conditions are reported to the operator interface. The LCD will display a text description of the fault. Refer to Section 5, Troubleshooting, for detailed descriptions of system fault conditions.

### PV Ground Fault Detection

The PV-30208 is equipped with ground fault detection circuitry (see Section 3, Installation and Section 7, system schematic for further detail). Upon detection of 10 amps of ground fault current, the PV-30208 executes an orderly shutdown, and annunciates a ground fault at the operator interface. The PV-30208 will remain faulted until the ground fault is remedied and cleared at the operator interface (see section 5, troubleshooting). To enable this feature for monopolar pv array configuration, a jumper is installed between TBDC- and TB NEUT on the PV input terminal block. This must be the only point of PV conductor ground. Monopolar pv array configuration is enabled by default (for a detailed description of bipolar and monopolar pv array configurations, see Section 4, Operation Features).

## **ISOLATION PROCEDURE**

### **Anti Island Protection**

A digital phase-shift-loop (PSL) circuit is implemented in the DSP inverter controller to prevent “Islanding” of the PV-30208.

The DSP continuously makes minor adjustments to the power factor phase angle above and below unity. In the event of a utility outage, these adjustments destabilize the feedback between the inverter and the remaining load, resulting in an over/under frequency or voltage condition. The PV-30208 then performs an orderly shutdown. The fault condition will remain until the utility voltage and frequency have returned to normal for 5 minutes.

This method has been extensively tested and proven to exceed the requirements of UL1741.

The following procedure should be followed to de-energize the PV-30208 for maintenance:

### **WARNING**

**The terminals of the PV input may be energized if the arrays are energized. In addition, allow 5 minutes for all capacitors within the enclosure to discharge after disconnecting the PV-30208 from AC and DC sources.**

1. Turn the on/off switch to the off position.
2. Open the PV array disconnect switch (if present).
3. Open the AC interface disconnect (if present).
4. Open the isolation transformer circuit breaker.
5. Install lockout devices on the isolation transformer circuit breaker and PV disconnect switch (if present).

## ISOLATION TRANSFORMER REQUIREMENTS

The PV-30208 UL1741 certification requires the use of a Xantrex Technology specified 30 kVA WYE/WYE isolation transformer between the inverter AC output and the utility interconnection (see Appendix in Section 7 for transformer dimensions and specifications). This custom 30 kVA isolation transformer is not part of the 30 kVA inverter, but can be ordered as a separate item. If maintaining the listing to UL1741 is not a requirement for your application, contact Xantrex Technology for a fact sheet describing the installation options and precautions for installing this inverter in a photovoltaic system that does not require UL1741 compliance.

### WARNING

**Xantrex Technology requires installing an isolation transformer between the PV-30208 inverter and the point of utility interconnection. Failure to do so could result in catastrophic damage to the PV-30208 as well as the utility distribution system and will void the product warranty.**

#### Inverter Side Isolation Transformer Requirements

The inverter side of the isolation transformer is configured as a WYE, and is rated for 208 VAC. **The neutral connection on the inverter side must be left floating.** If the neutral is tied to ground, the inverter will be damaged internally at power-up.

#### Utility Side Isolation Transformer Requirements

The utility-side windings of the isolation transformer are configured WYE and must match the voltage at the utility inter-tie. Verify that the transformer supplied matches the voltage requirement. Also, the transformer is supplied with a neutral connection on the utility side. Connection of this utility-side neutral does not affect the operation of the inverter. Check the local utility of jurisdiction for their requirements regarding the connection of this neutral.

Contact your Xantrex Technology distributor if you have any questions regarding isolation transformer requirements.

## TORQUE AND WIRE GAUGE SPECIFICATIONS

The following torque specifications are to be used on all electrical interfaces made during installation of the PV-30208.

Torque Table	
Terminal Block or Bolt Size	Torque Setting
5-16 Copper Lug	52 in lbs./5.9 Nm
AC and DC Terminals	275 in lbs/31.1 Nm



The following table shows acceptable wire gauges to be connected to the PV-30208 AC and DC inputs.

Wire Gauge Table	
Termination	Wire Range AWG
Distribution Block (AC)	2/0-#2
Distribution Block (DC)	2/0-#2

## INSTALLATION INSTRUCTIONS

CAUTION
<b>All wiring methods shall be in accordance with the National Electrical Code ANSI/NFPA 70. All power conductors interfacing to the PV-30208 should be sized in accordance with the National Electric Code ANSI/NFPA 70 and local codes. Large gauge wire must have a minimum bend radius dependent upon the wire gauge (refer to the National Electric Code, Article 373-6B). Take care to keep the wire bundles away from any sharp edges which may damage wire insulation over time. Xantrex Technology recommends using No. 2 AWG, 105 degrees C, minimum, copper wire for all connections with the PV-30208.</b>

### Ventilation Considerations

Check with applicable installation standards for additional clearance requirements.

### Installation

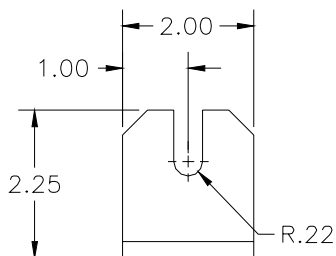
The PV-30208 is designed to be both floor mounted, or wall mounted. The following procedures describes mounting instructions for both mounting methods.

#### Floor Mounted

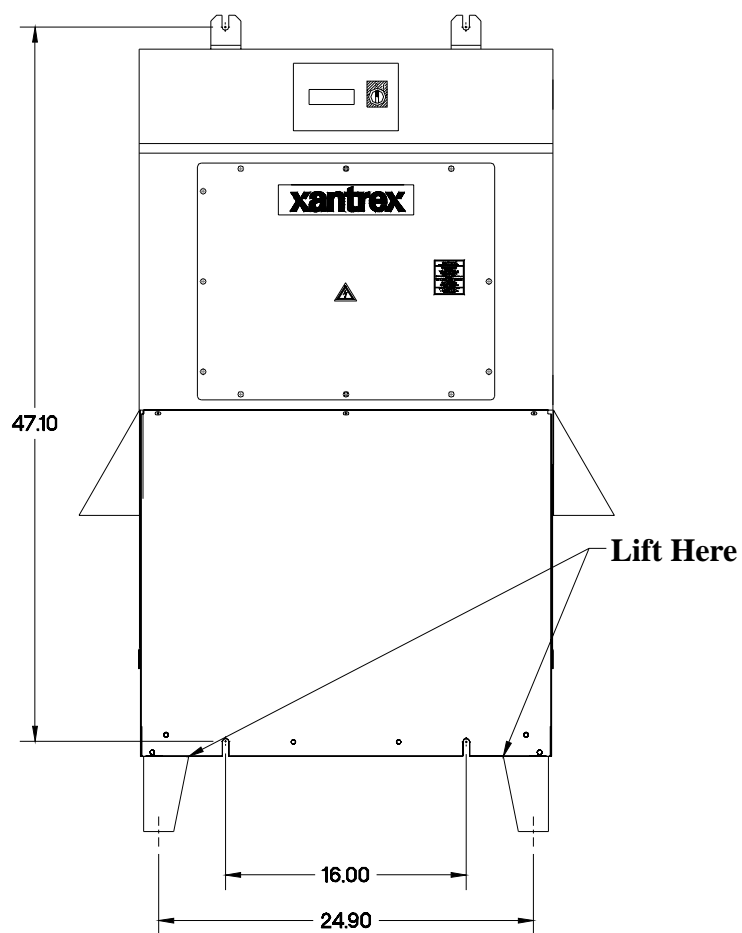
1. Move the PV-30208 into place. Lift the PV-30208 from beneath the lower enclosure with a forklift as shown in **Figure 3-2**. (See following page.)
2. Anchor the lower enclosure feet to the floor with 1/2" anchor bolts.

#### Wall Mounted

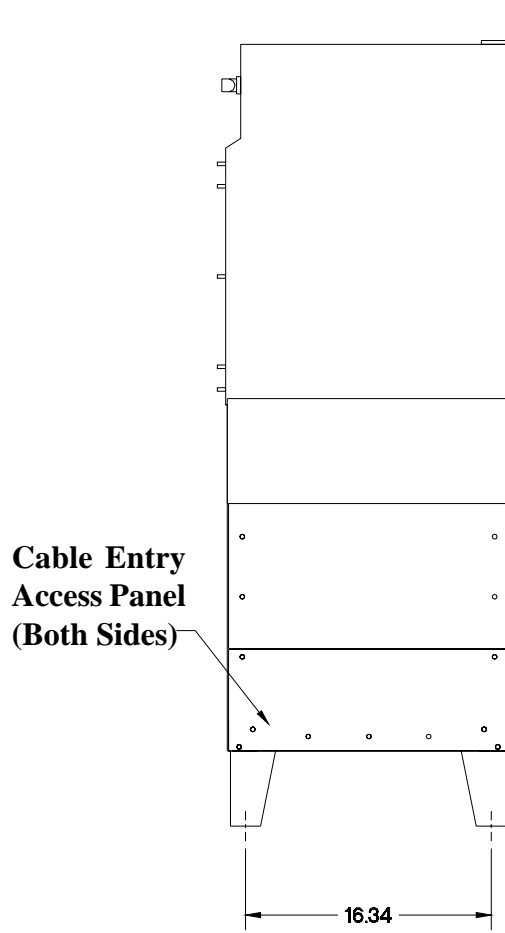
1. Screw two 3/8" x 3-1/2" long lag bolts into existing studs in the wall (16-inch mounting center) at lower mounting level on PV-30208. Lag bolts should be horizontally level with each other. Leave a minimum of 1" of bolt protruding from the wall.
2. Place the PV-30208 bottom mounting ears, shown in **Figure 3-1 and Figure 3-2** onto installed lag bolts. (See following page.)
3. Hold the unit against the wall and install the upper lag bolts (3/8" x 3-1/2"). Tighten the bolts firmly.
4. Tighten the lower lag bolts while the unit is held in place.
5. Two access panels on the lower enclosure are provided for cable entry, shown in **Figure 3-3**. (See following page.)
6. Local building codes may require additional support/reinforcement when wall mounting the PV-30208. Check with local authorities for further detail.



**Figure 3-1**



**Figure 3-2**



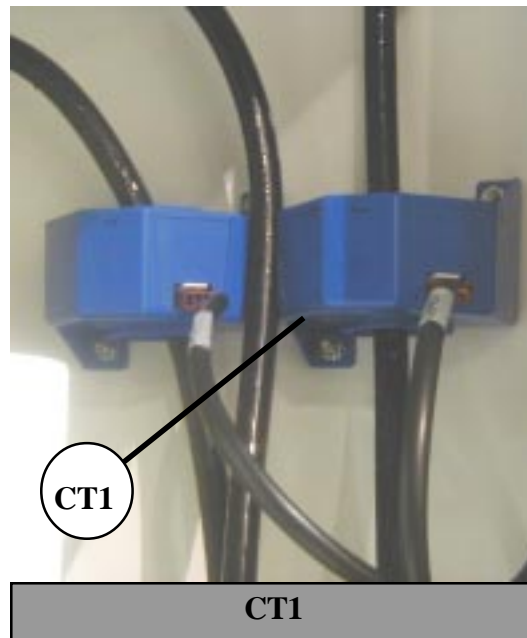
**Figure 3-3**

**Array Grounding**

NEC 690-41/42 requires the PV array to be earth grounded. The PV-30208 is shipped with a ground bond for installation between the pv negative terminal block to the pv safety ground terminal block. The PV-30208 chassis is also bonded to the PV safety ground terminal block. This ground bond is clearly marked with a warning label which must be read before installation. **For floating PV array configurations, the factory installed PV negative ground bond must not be installed.** Installation of this ground bond will cause irreparable damage to the PV-30208. For bipolar PV array configurations, the installer must move the ground bond between the PV array midpoint and the safety ground terminal block. Refer to the system schematic in Section 7, Appendix for further wiring configuration.

**Ground Fault Detection**

The PV-30208 is equipped with a ground fault detection circuit and current transducer (CT1 in illustration). This circuit is active when the PV array is grounded as described in the previous section. In the event of a greater than 10 amp ground fault, the PV-30208 will execute an orderly shutdown and annunciates a ground fault at the operator interface. The PV-30208 will remain faulted until the ground fault is remedied and cleared at the operator interface (see section 5, Troubleshooting).



**CAUTION**

**The input and output circuits are isolated from the enclosure and the system grounding, if required by sections 690-41, 690-42 and 690-43 of the National Electrical Code, ANSI/NFPA 70, is the responsibility of the installer.**

**Phase-Sequencing**

The PV-30208 is equipped with an automatic sequence-phase-detection control algorithm. This allows the utility interface conductors to be connected in any sequence convenient at the time of installation. Upon system initialization at power-up, the PV-30208 determines the phase sequence of the utility connection and configures the modulator drivers accordingly.

**INTERCONNECTION WIRING**

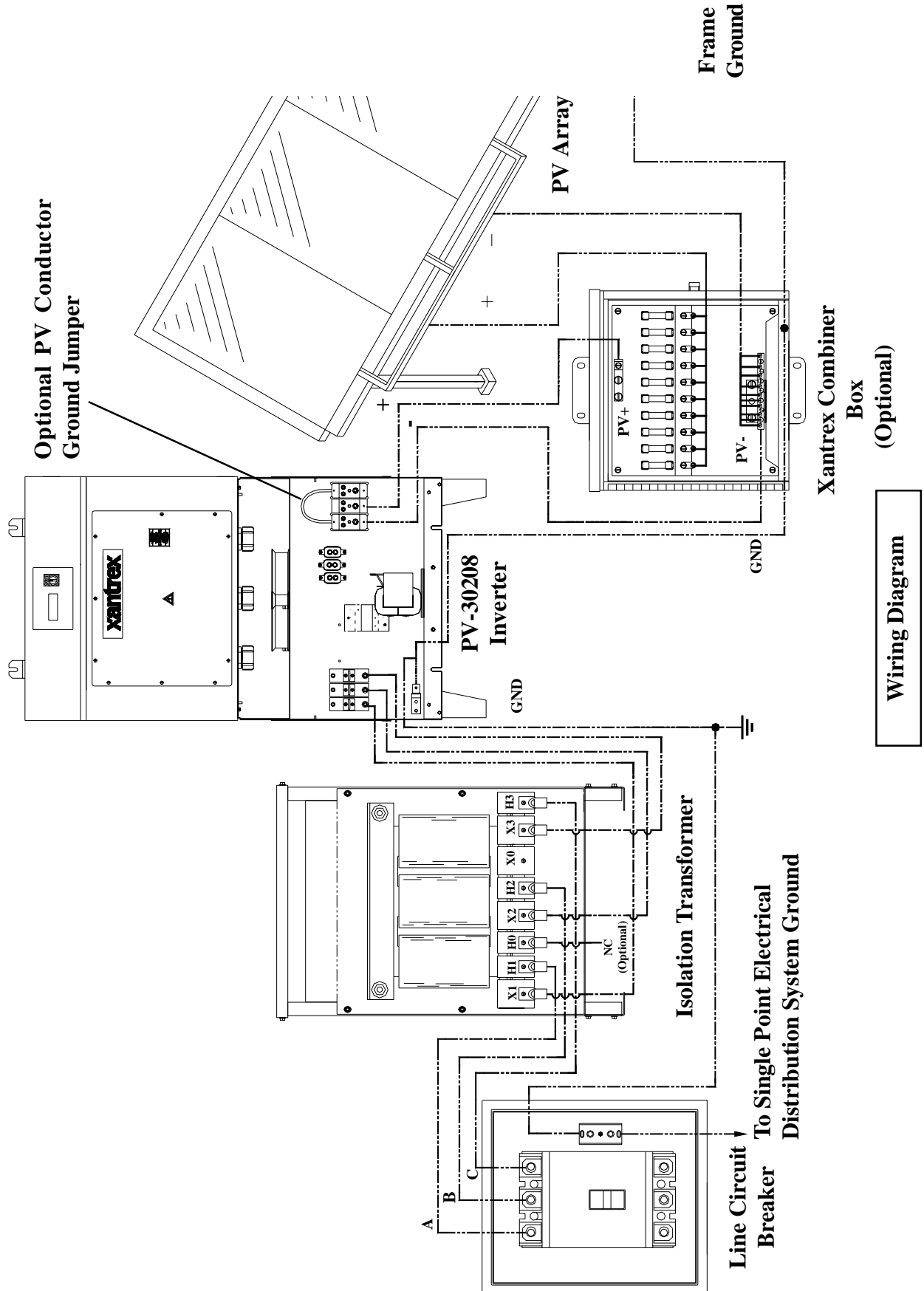
**CAUTION**

**To reduce the risk of fire, connect only to a circuit provided with 125 amperes @208VAC, or 50 amperes @480VAC maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.**

The following wires for connecting the PV-30208 to external devices are not provided by Xantrex Technology: (See wiring diagram on page 3-6.)

- 3-Phase 208 VAC inverter output to terminals of the 208 VAC primary side of isolation transformer. **The neutral must be left floating. Ground loops will exist when the inverter starts switching, which will cause the inverter to shut down due to phase over-currents and will result in damage to the PV-30208. Also, insure that this neutral is not bonded to the isolation transformer frame.**
- System electrical ground to the isolation transformer chassis ground.
- Isolation transformer grid side terminals to line circuit breaker (or the AC disconnect switch if present).
- PV frame ground to PV-30208 enclosure chassis ground stud.
- PV-30208 enclosure chassis ground stud to the electrical distribution system ground.
- PV+ to the inverter enclosure terminal block TBDC+.
- PV- to the inverter enclosure terminal block TBDC-.
- PV neutral if connecting a bipolar PV array.

Install all wires listed above. Refer to the following wiring diagram and the system schematics in Section 7 for more detailed terminal locations.



## **INITIAL TURN ON PROCEDURE**

The following must be performed by an approved Technician:

The following procedures are intended to verify correct installation and proper operation of the PV-30208. These steps are to be followed sequentially. Do not continue if any of the steps or results are unclear. Refer to Section 4 for a detailed description of system operation. Refer to Section 5 for fault condition descriptions and troubleshooting. Refer to Section 7 for detailed system schematics.

### **Visual Inspection, Isolation Transformer WYE/WYE**

- Verify the isolation transformer circuit breaker is open.
- Remove the isolation transformer access panel.
- Insure the neutral on the inverter side of the isolation transformer is left floating. The transformer neutral must not be connected to the utility side neutral, the transformer chassis, or ground. **If the inverter side neutral is tied to ground, the inverter will not function properly. Also, insure that the neutral is not bonded to the isolation transformer frame.**
- Verify the inverter 208 VAC conductors are connected to the isolation transformer.
- Verify the utility conductors are properly connected to the isolation transformer.

### **Visual Inspection, PV-30208**

- Insure AC and DC disconnect switches are opened (if present).
- Insure PV array string disconnect switches are opened (if present).
- Open the upper and lower enclosure access panels.
- Verify all wire connections are tight.
- Inspect the cables between the lower enclosure terminal blocks and the upper enclosure matrix and driver board. All wire harnesses should be snap-locked into their respective PCB headers.

### **Visual Inspection, PV Array Wiring**

- Verify the PV+, PV-, PV neutral (if array is bipolar), and PV safety ground are isolated from each other. Refer to system schematic in Section 7.
- Verify PV array is properly grounded. Refer to previous section on PV array grounding.
- Verify all PV fuses are installed (if present).
- Verify PV string diodes are wired properly (if present).
- Verify proper PV voltage polarity at the PV string disconnect/combiner boxes.

### **Initial Power**

- Close the isolation transformer circuit breaker.
- Verify 208 VAC voltage across the AC disconnect.
- Close the AC disconnect (if present).
- With the DC disconnect switch open (if present), close one of the PV array string disconnect devices.



- Carefully measure VDC at the PV disconnect switch. The value should be the same as at the PV array string disconnect device. It should also be positive.
- Close the PV disconnect switch (if present).
- Carefully measure VDC across TBDC+ and TBDC- (PV +/-) terminal block. The value should be the same as at the PV array string disconnect device. It should also be positive.
- Open the PV disconnect switch. The matrix capacitor bank voltage should slowly degrade to near zero over a 5-minute period.
- Open all PV string disconnect switches.

### **System Verification**

- Ensure the on/off switch is disabled.
- Upon applying 208 VAC power to the PV-30208, observe the LCD display on the upper enclosure. The LCD should display 'init-FCU Version', followed by the model number and software revision before briefly going blank. The LCD may be difficult to see depending on external light conditions. After approximately 15 seconds the panel should finish initialization. Upon completion, line 1 (system status) of the LCD should read 'Shutdown'.
- Remedy any faults reported. If the fault indicator does not change, the fault condition is still present (see Section 5). Cycling the on/off switch will reset the PV-30208 and attempt to clear any system faults. Once all faults are cleared, line 1 of the LCD will read 'Shutdown' indicating the PV-30208 is idle.
- Close all PV array string disconnect switches (if present).
- Close the main PV disconnect switch (if present).
- Turn the on/off switch to the on position.
- If the PV voltage is above the PV Start Voltage setpoint, and the PV Start Time is exceeded, the PV-30208 should transition to "Power Tracking" (see Section 4, Operation).
- Depending upon solar conditions, the PV-30208 may not operate at full power. If the PV array is not experiencing full sun, the PV maximum power tracker will regulate the PV voltage to maintain maximum PV power output. (See section 4 for further description of the peak power tracker).
- The PV-30208 is now fully operational.

### **Fine Tuning**

- All PV-30208 operating parameters have been set at the factory, based upon prior experience with various PV arrays. Contact your Xantrex Technology distributor for further information.
- It is recommended that the PV-30208 be watched during Wake-Up and Sleep Test. If the PV-30208 cycles between operating and sleeping at either of these times, the operating setpoints may not be set properly. (Refer to Section 4 for a detailed description of PV-30208 operating states). The PV-30208 should not cycle if the setpoints are set properly.

#### **NOTE**

**Some field adjustable parameters are password protected and may only be changed by trained service technicians. In particular are parameters relating to utility protection setpoints. These have been set in the factory to the limits mandated by UL1741. Any changes to these setpoints should be agreed upon by the local utility and the equipment owner.**

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## DESCRIPTION OF SYSTEM OPERATION

### Overview

The PV-30208 is a fully automated grid-tied photovoltaic inverter. Manual interaction or control of the inverter is necessary only in the event of a system fault. The following conditions govern PV-30208 operation:

- Stable utility voltage and frequency must be present for all states of operation.
- Fault states are automatic from any state of operation. A fault will cause the PV-30208 to immediately stop processing all power. The fault condition will be reported to the operator interface.
- The on/off switch, located on the upper enclosure of the PV-30208, must be switched to the on position for all operating states.
- Cycling the on/off switch attempts to clear any system faults and return the PV-30208 to normal operation.

### Operating States

Control software governs the operation of the PV-30208. There are six main operating states. The following descriptions depict the LCD interface. Line 1 (system status) of the LCD will indicate operating states on the display.

- **Initializing:** The LCD displays 'Initializing'. The PCU monitors the status of the PV array and utility grid, waiting until the PV array voltage is sufficient to export power to the utility.
- **Wake-Up:** The LCD displays 'Wake Up Test'. Once the PV voltage is sufficient to export power to the utility grid, the PV-30208 will wait 5 minutes before starting. This insures the PV voltage is not transient in nature and keeps the system from cycling during unstable irradiance conditions.
- **Power Tracking:** The LCD displays 'Power Tracking' while the PV-30208 delivers power to the utility. This is the standard operating state of the PV-30208. The PV-30208 maximum power tracker will optimize power output from the PV array. If available PV power is above the maximum power rating of the PV-30208, the inverter will current limit, which will cause the PV voltage to rise above the array peak power voltage. The minimum operating voltage of the PV-30208 is typically around 300 VDC. The power tracker will not track voltage below this point, regardless of the actual peak power voltage of the PV array.
- **Sleep Test:** The LCD displays 'Sleep Test' while the control system begins a 5 minute sleep test. This normally indicates the PV irradiance is declining as the sun sets. If the output power remains below 200 watts during the 5 minute sleep test, the system will transition to standby. The time delay allows the inverter to ride through any temporary irradiance reductions.
- **Fault:** The PV-30208 has encountered a fault condition. When this happens, regardless of the PV-30208 state-of-operation, the PV-30208 will stop processing all power and execute an orderly system shutdown. Line 2 will display the fault description with the fault code displaying on line 3.
- **Shutdown:** The LCD displays 'Shutdown'. The PV array does not have enough power capacity to maintain the inverter operating losses or the line contactor is open and the devices are not switching.



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## **OPERATION FEATURES**

### **Automatic Phase Sequence Detection**

During system power-up, the PV-30208 detects the phase rotation of the three-phase utility voltage as seen at the inverter output terminals. The control software then determines the proper switching sequence for the output power stage. It is not necessary to maintain a particular phase sequence convention between the inverter and the utility point of interconnection.

### **Fixed Unity Power Factor Operation**

The Xantrex PV series grid tied PV inverters maintain unity power factor during operation. The control software constantly senses utility voltage, and constructs the output current waveform to match the utility voltage. The PV line of inverters are not capable of operation without the presence of normal utility voltage, nor are they capable of varying the output power factor off unity.

### **Variable Minimum DC Input Voltage Level**

The minimum DC input voltage limit for the PV-30208 is a function of the utility AC line voltage. The PV-30208 control software periodically changes the minimum allowable DC input voltage based upon the actual line voltage during operation.

For monopolar PV array configurations: Minimum DC voltage will vary between 282 and 320Vdc for line voltage fluctuations between factory set minimum and maximum line voltage limits. For example: At the factory set high line voltage limit of 220.5, the minimum required DC input voltage is approximately 320Vdc. At the factory set low line voltage limit of 196Vac, the minimum required DC input voltage is approximately 282Vdc. At nominal 208Vac, the minimum DC input voltage is 300Vdc.

For bipolar array configurations: Minimum DC voltage will vary between approximately 340 and 380Vdc.

### **Utility Voltage/Frequency Fault Automatic Reset**

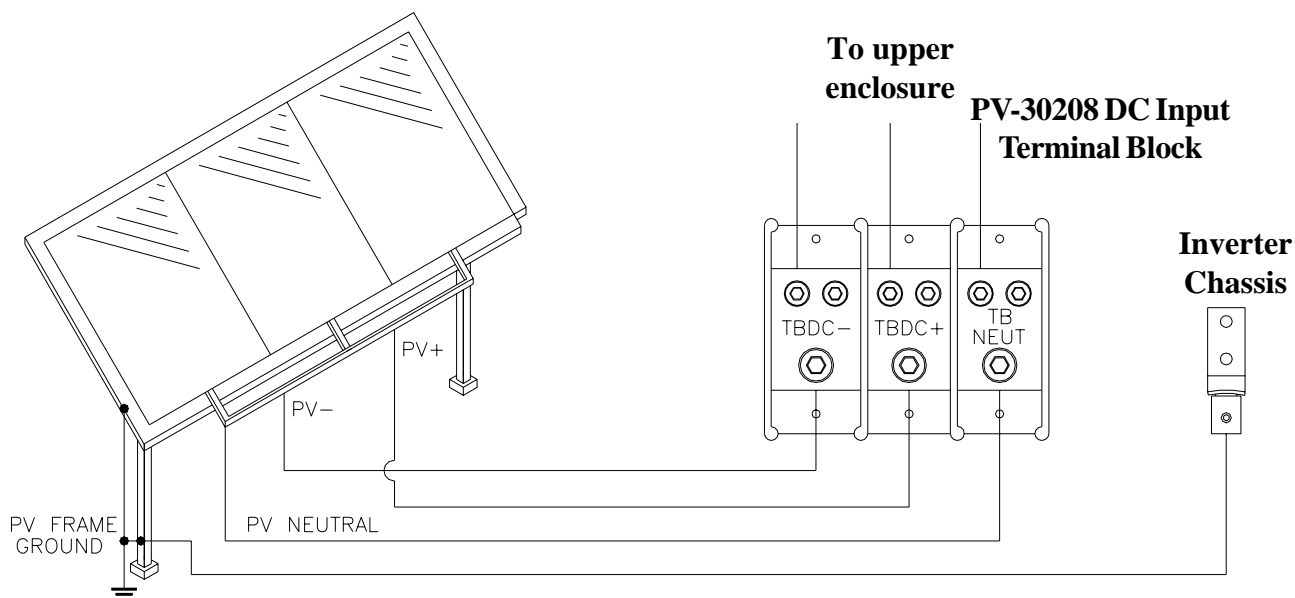
In the event of a utility voltage or frequency excursion outside of preset limits, the PV-30208 will stop operation and annunciate a fault at the operator interface. Once the utility voltage has stabilized within acceptable limits for a period of at least five minutes, the PV-30208 will automatically clear the fault and resume normal operation. Voltage and frequency fault setpoints are detailed later in this section.

### **Active Island Detection**

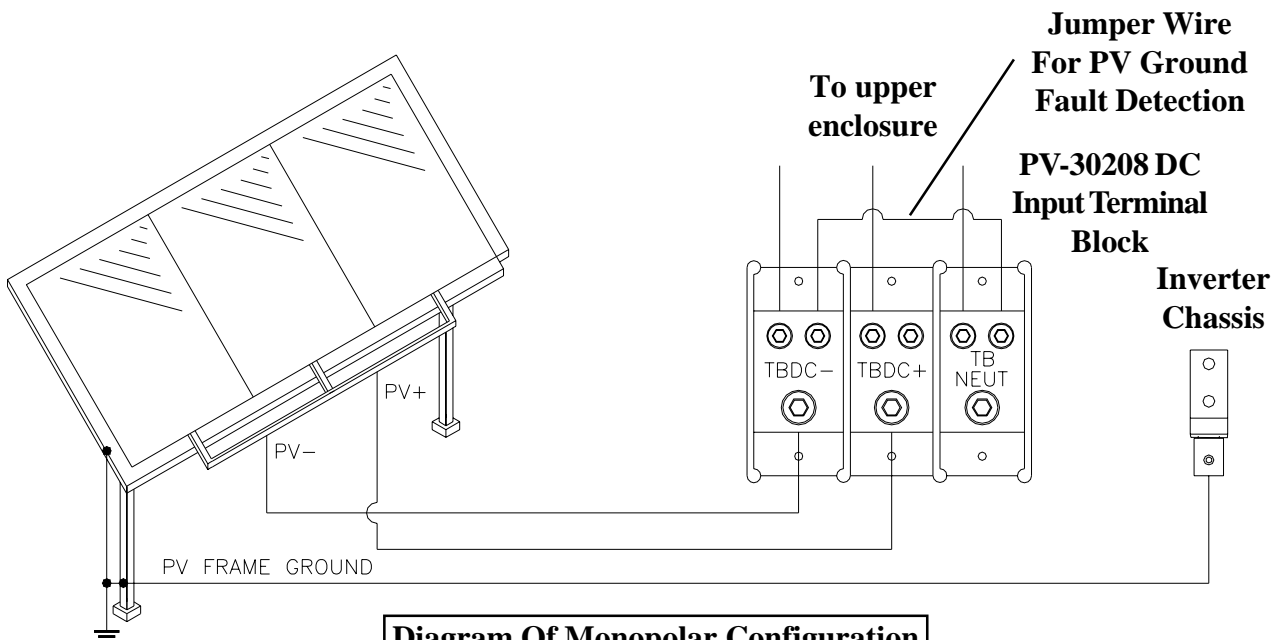
Much concern has been given to the possibility of an inverter causing a 'utility island' condition during a utility power outage. An island condition is defined as grid tied inverter maintaining operation and supporting a load that has been isolated from the utility power source. This requires the load to be closely balanced to the output power of the inverter as well having a resonant frequency close to 60Hz. Needless to say, this is a extremely remote possibility. To insure this condition does not occur, the PV-30208 control software contains an active phase-shift-loop algorithm, which destabilizes a balanced load, which may otherwise be capable of maintaining inverter operation in the absence of utility voltage. This feature has been extensively tested and proven to exceed the safety requirements of UL-1741 and IEEE-929-2000.

**Ground Fault Detection**

The PV-30208 is capable of detecting PV array ground fault current. To enable this feature, a wire must be installed between ground and the desired ground reference point on the PV array. For bipolar PV array configurations, the ground wire must be connected between the PV array neutral point and TB-NEUT terminal block. For grounded monopolar PV array configurations, the ground wire must be connected between TBDC- and TB NEUT terminal blocks (see the following diagram for clarification and the system schematic in Section 7). A jumper wire is included separately with the PV-30208. This feature is enabled for grounded monopolar pv array configuration at the time of shipment. For bipolar pv array configuration, the jumper wire must be removed between TBDC- and TB NEUT.



**Diagram Of Bipolar Ground Fault Detection Configuration**



**Diagram Of Monopolar Configuration**

### **Current Imbalance Detection**

In the event of phase-to-phase current imbalance of greater than 20% between phases, the inverter will execute an orderly shutdown, and announce a fault at the operator interface. See Section 5, Troubleshooting, for further information on this fault condition.

### **DC Overvoltage Detection**

In the event of DC voltage greater than 600Vdc, the PV-30208 will execute an orderly shutdown and announce a fault to the operator interface. If DC voltage remains greater than 600Vdc, the PV-30208 may be irreparably damaged. See Section 5, Troubleshooting for further information on this fault condition.

### **Peak Power Tracking**

The PV-30208 control software employs an active PV peak power tracker, designed to maintain maximum power output from the PV array at all times of operation. The peak power voltage point varies primarily depending upon the temperature of the PV cells. The PV-30208 constantly seeks the optimum voltage and current operating points of the PV array to maintain maximum PV power output.

### **Automatic Wake Up PV Voltage Optimization**

Every day the PV-30208 wakes up and starts producing power, the control software determines if it is necessary to make adjustments to the start voltage setpoint. If the PV-30208 wakes up and determines that there is insufficient PV array power to support inverter operation, the start voltage setpoint is shifted slightly higher. This assumes that once the voltage on the array has risen, there will be greater PV power as the PV array is exposed to higher irradiance. Conversely, if the PV-30208 wakes up and determines that there is more power than is necessary to support inverter operation, the PV start voltage setpoint is lowered. The PV start voltage setpoint will usually be optimized over the period of one week. This value may be manually adjusted via the graphical user interface program to expedite the optimization process. There is also a user settable timer that determines the time required for the PV start voltage to exceed the start voltage setpoint. This timer may also be manually adjusted via the graphical user interface to help compensate for poorly placed PV arrays. The default wake-up time delay is factory set at five minutes.

### **Automatic Sleep Test**

Toward the end of every solar day, the PV-30208 automatically determines when to stop producing power dependent upon the output power of the inverter. As the net output power of the PV-30208 nears zero, a timer is started to allow the inverter to ride through any brief irradiance reductions. The default sleep time delay is factory set at five minutes.

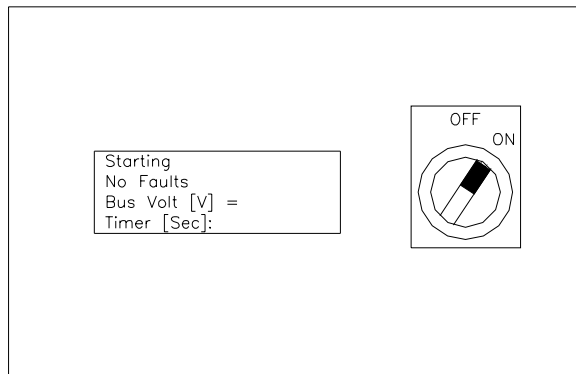
## OPERATOR INTERFACE

The PV-30208 is equipped with an Liquid Crystal Display. The display consists of 4 text lines containing the following information:

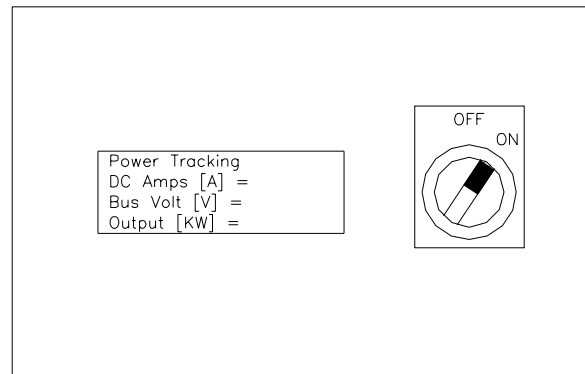
- **Line 1: System Status** - The current operating state of the inverter.
- **Line 2: DC Current or Fault Descriptions** - This line reports the DC current (amps). If the PV-30208 is faulted, this line will report a description of the fault condition.
- **Line 3: Bus Voltage or Fault Code** - This line reports the Bus Voltage, in volts. If the PV-30208 is faulted, this line will report a code for the fault condition.
- **Line 4: Inverter Output Power or Countdown Timer** - During normal operation, this line will report the inverter real time output power. During initialization or start-up, this line displays the countdown timer.

The on/off switch is used to enable or disable system operation. The on/off switch is also used to reset the inverter and clear any system faults.

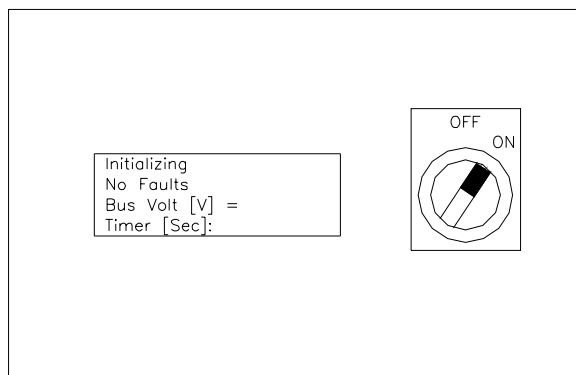
The following is a typical display of the LCD during the six main operating states and an on/off switch.



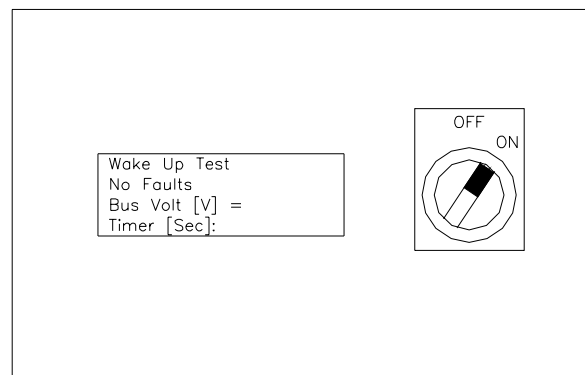
**System Starting**



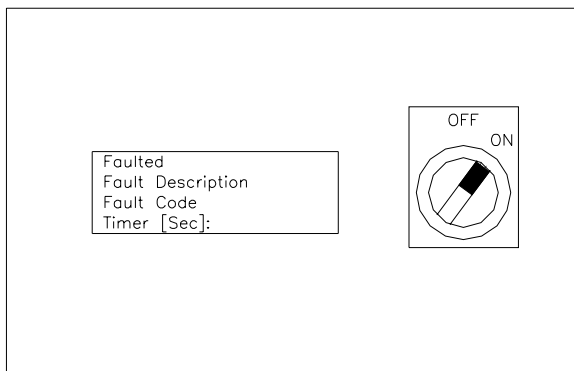
**Power Tracking**



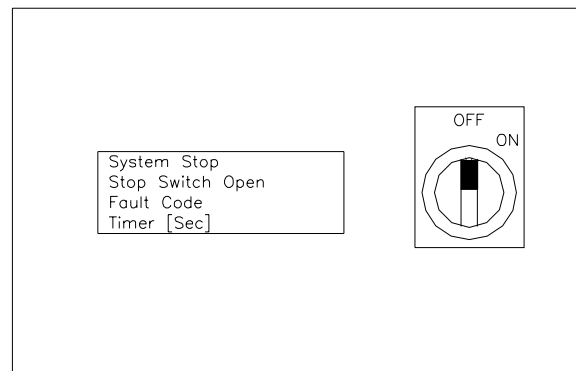
**Initializing**



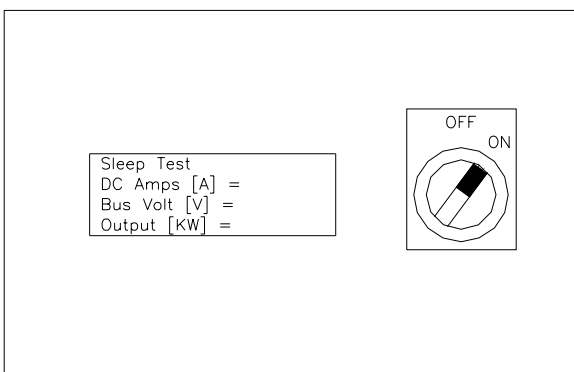
**System Wake Up Test**



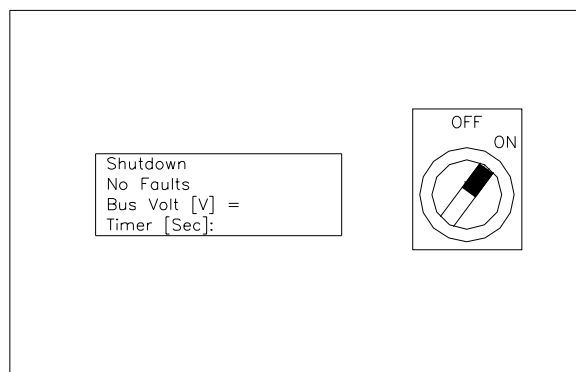
**System Fault**



**System Stop**



**System Sleep Test**



**System Shutdown**

**EXAMPLE OF NORMAL SYSTEM OPERATION**

Upon initial application of AC voltage, the LCD located on upper enclosure will display ‘Shutdown’ for approximately 15 seconds. Once the system has finished initializing, the PV-30208 will remain in standby until adequate PV voltage is available. 5 minutes after the PV start voltage has been reached, the PV-30208 will synchronize to the utility grid and begin peak power tracking the PV array. The time delay protects the inverter from excessive on/off cycling.

The PV-30208 will continue to process power until the AC output power approaches the operating losses of the inverter for a period of 5 minutes. The time delay protects the inverter from excessive on/off cycling.

## **SYSTEM OPERATING PARAMETERS**

The PV-30208 contains a number of system operating parameters which may be field adjusted using an optional graphical user interface program (contact Xantrex Technology for further information). All operating parameters have been set at the factory during system test based upon prior experience with various PV arrays, or to be in compliance with UL1741. In general, the factory default settings allow for stable, efficient operation of the PV-30208 connected with any PV array configured for a 300-600 VDC peak power voltage point.

On the following page is a list of the PV-30208 operating parameters, showing valid ranges and the factory default settings. Many of these parameters are specific to domestic or European operation. Changing parameters not applicable to the region of operation will not affect inverter performance. Some field adjustable parameters are password protected and may only be changed by trained service technicians, specifically parameters relating to utility protection setpoints. These have been set in the factory to the limits mandated by UL1741. Any changes to these setpoints should be agreed upon by the local utility and the equipment owner. The ability to adjust the voltage and frequency setpoints across the actual utility voltage and frequency has been provided as a simulation tool to verify the PV-30208 accurately detects and responds to a utility excursion. This test should only be performed by a trained service technician. It is possible to adjust the setpoints in a manner that will prevent the PV-30208 from functioning.

<b>Parameter</b>	<b>Description</b>	<b>User Settable Range</b>	<b>Resolution</b>	<b>Factory Default Setting</b>	<b>Password Protected</b>
Volts Max	Maximum Allowable Utility Voltage	166.4-249.6	0.1 V	228.8	*
Cycle Max	High Line Voltage Timer, Cycles	2-120	1 Cycle	115	*
Volts Min	Minimum Allowable Utility Voltage	166.4-249.6	0.1 V	183.0	*
Cycles Min	Low Line Voltage Timer, Cycles	2-120	1 Cycle	115	*
Freq Max Delta	High Line Frequency Level	-3.0-3.0	0.1 Hz	0.5	*
Freq Min Delta	Low Line Frequency Level	-3.0-3.0	0.1 Hz	0.5	*
Freq Max Delay	Maximum Allowable Time Response To A Utility High Frequency Excursion	2-60	1 Cycle	6	*
Freq Min Delay	Maximum Allowable Time Response To A Utility Low Frequency Excursion	2-60	1 Cycle	6	*
Line Fault Reset Delay	Line Fault Reset Delay Time	0-300	1 Second	300	*
PV Start V	PV Wake Up Voltage	269.7-600.0	0.1 V	380	
PV Decision W	Maximum Start Up Power	47.0-4700.0	0.1 W	1880	
PV_Start_Time	PV Wake Up Time	10-600	1 Second	300	
PV_Sleep_Time	PV Sleep Time	10-600	1 Second	300	
Gnd Current Max	Maximum Earth Fault Current Limit	1.0-20.0	0.1 A	10	

<b>Parameter</b>	<b>Description</b>	<b>User Settable Range</b>	<b>Resolution</b>	<b>Factory Default Setting</b>	<b>Password Protected</b>
Earth_Volts_Max	Maximum Earth Voltage	0.0-300.0	01 VDC	50	
Anti_Island_Method	Anti-Island Method	0=Off, 1=Up/Down Freq, 2=Up Freq, 3=Down Freq		1	*
PPT_Ramp_Time	PPT Ramp Time	1-60	1 Second	20	
PPT_V_Step	PPT Voltage Step	0.1-10.0	0.1 VDC	1	
PPT_Max_I_Percent	Commanded Output Power As A Percent Of Rated Power	0-100	1 A	100	
Data_Log_Rate (Unsupported)	Data Logging Rate	1=15s, 2=1m,3=5m, 4=15m		4	
Data_Log_State	Data Logging Rate	0=Off, 1=On-Line, 2=Continuous		2	
G_F_Selector	Ground Current Detection	0=Domestic, 1=International		0	
FSET_Rate	FSET Rate	0-100%		50	
Serial_Number	Inverter Serial Number	0-65535	N/A	Factory Set	*



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**GENERAL**

In the event of a fault, the PV-30208 will annunciate the condition at the operator interface. The PV-30208 will execute an orderly shutdown and remain faulted until the fault is cleared (manually or automatically).

In general, the operator should respond to any PV-30208 fault as follows:

1. The source of the fault should be sought by referring to the following chart.
2. Rectify the fault condition and attempt to clear the fault by cycling the on/off switch.
3. If the problem cannot be corrected, note and write down the fault code and description, then contact your Xantrex Technology distributor for assistance or service.

**FAULT CONDITIONS**

**LCD Fault Annunciation**

The LCD interface reports fault conditions on Line 2 and 3. The fault code number will follow a text description. The fault description will remain displayed until the fault has been corrected and cleared. Each fault is described on the following page.

**Fault Clearing**

Faults may be cleared automatically by the PV-30208 or manually by the operator depending upon the type of fault. The utility protection faults (over/under AC line voltage and frequency) are self-clearing fault conditions. Once the utility voltage and frequency returns within allowable operating ranges, for a period of five minutes, the PV-30208 will clear the fault and resume normal operation.

Latching faults must be cleared manually by the system operator. Once the cause of the fault condition has been corrected, the fault may be cleared with the on/off switch. First turn the switch to the off position and then back to the on position in order to reset the inverter. If a fault is sustained, the inverter will not reset, and will continue to report the fault. If the fault has been corrected, the LCD will return to the normal display, and the PV-30208 will resume normal operation.



**LCD Display and On/Off Switch**

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**FAULT DESCRIPTIONS AND TROUBLESHOOTING**

**FAULT DESCRIPTIONS**

<b>Fault Description</b>	<b>Fault Code (LCD)</b>
IPM Device Fault A+	0x0001
IPM Device Fault A-	0x0002
IPM Device Fault B+	0x0004
IPM Device Fault B-	0x0008
IPM Device Fault C+	0x0010
IPM Device Fault C-	0x0020
AC Line Under Voltage	0x0100
AC Line Over Voltage	0x0200
AC Line Under Frequency	0x0400
AC Line Over Frequency	0x0800
Ground Current Fault	0x8000
DC Bus Over Voltage	0x4000
CT Offset Fault	80000
Current Imbalance	100000

**(1) IPM Device Fault (0x0001 Through 0x0020)**

Both over current and over temperature condition can cause IPM device faults. The fault code for both conditions is the same for each device, while there is a unique fault code for each device.

Possible causes for over current condition:

- Short circuit in output AC line.
- Low supply voltage to IPM control circuit.
- Shorted isolation transformer.

Possible causes for over temperature condition:

- External cooling fan inoperable.
- Airflow on heatsink impeded due to accumulation of debris.
- Operation above rated ambient temperature for an extended period of time.
- Auxiliary contact block on contactor K1 inoperable. This is only possible if the fan does not operate

when the contactor closes. Carefully check voltage at the K1-N.O. aux. contact to the ground bus when the contactor is closed. (See schematic in Section 7).

**(2) AC Line Voltage Low Fault (0x0100)**

The utility AC voltage fell below the minimum programmed limit. There are two levels of response to low line voltage conditions. The first level of response is set to 183.0 VAC with a time delay of 2 seconds. By default, the second level is set to 104 VAC with a time delay of less than 0.1 seconds. Voltage setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

Possible causes:

- The utility voltage fell below the allowable limit (183.0 VAC by default). Verify the utility voltage is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

This fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes.

**(3) AC Line Voltage High Fault (0x0200)**

The utility AC voltage exceeded the maximum-programmed limit. There are two levels of response to high line voltage conditions. The first level of response is set to 228.8 VAC with a time delay of less than 2 seconds. By default, the second level is set to 285.0 VAC with a time delay of less than 2 cycles, and is not field adjustable. Voltage setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

Possible causes:

- The utility voltage exceeded the allowable limit (228.8 VAC by default). Verify the utility voltage is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

The fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes.

**(4) AC Line Under Frequency Fault (0x0400)**

The AC utility frequency fell below the minimum programmed limit. This limit is set to 59.5 Hz and the system response time limit is set to less than 0.1 seconds to insure the PV-30208 disconnects from the utility within the time allowed by UL1741. Frequency setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

Possible causes:

- The utility frequency fell below the allowable limit (59.5 Hz by default). Verify the utility frequency is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

This fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes. Frequency setpoints may be modified via the operator interface program. Utility protection setpoints may only be adjusted by trained personnel with approval by both the local utility and the equipment owner.

**(5) AC Line Over Frequency Fault (0x0800)**

The AC frequency exceeded the maximum-programmed limit. This limit is set to 60.5 Hz and the system response time limit is set to less than 0.1 seconds to insure the PV-30208 disconnects from the utility within the time allowed by UL1741.

Possible causes:

- The utility frequency exceeded the allowable limit (60.5 Hz by default). Verify the utility frequency is stable and within allowable operating limits.
- There is a problem with one or more of the AC sense wires (see system schematic in Section 7).

This fault is auto-resetting. The unit will automatically restart after line has stabilized within normal limits for 5 minutes.

**(6) Ground Current Fault (0x8000)**

The earth safety ground current has exceeded the maximum-programmed value.

Possible causes:

- The negative wire from the PV array has been passed through CT1. Verify PV ground jumper is installed between TBDC- and TB NEUT.
- Inspect the PV array for actual ground faults.
- The PV array has been grounded in more than one location. If the PV array is grounded through CT1, it must not be grounded at any other location.
- CT1 defective: Contact your Xantrex Technology distributor for assistance or service.

**(7) DC Bus Over Voltage Fault (0x4000)**

The DC bus voltage has exceeded the maximum limit.

This is also the PV input voltage sense point. Check the PV input voltage at the PV disconnect switch. If the voltage is below 600 VDC and agrees with the voltage displayed on the LCD, cycle the on/off switch and restart the PV-30208.

Possible causes:

- The PV array open circuit voltage exceeded 600 VDC.
- There is a problem with the PV voltage sense wiring (see system schematic in Section 7).

**(8) CT Offset Fault (0x80000)**

Upon system startup, the PV-30208 has determined that the CT offset current is too large to be calibrated. This is caused by the control system detecting current, when no current is commanded.

- Observe individual phase currents with the operator interface program. Generally, a CT offset fault will show high currents on one phase while the system is in Standby, with zero actual current being

processed.

- Check +/- VDC power supply outputs.
- Check control wire harness integrity (Refer to the system schematic in Section 7).
- Check CT harness for damage.
- Check CT harness +/-15VDC at CT.
- Check CT output voltage (mV) with reference to ground.
- Replace CT showing high output voltage offset.

**(9) Current Imbalance Fault (0x10000)**

The PV-30208 has determined that there is an excessive phase-to-phase current imbalance, while the system is operating.

- Observe individual phase currents during operation with the operator interface program and with a true RMS oscilloscope. Verify waveforms are sinusoidal and maintain proper phase relationships.
- Determine which phase is imbalanced.
- Verify phase conductor wiring integrity (Refer to the system schematic in Section 7).
- Check CT control wire harness integrity (Refer to the system schematic in Section 7).
- Replace CT on the phase exhibiting the current imbalance.

**Stop Switch Fault**

The on/off switch, located on the upper enclosure, is disabled. The contact block on the back of the switch must be open for the PV-30208 to report this message.

If the switch is in the on position and the LCD reads 'Stop Switch':

- Isolate the PV-30208 from external power (Refer to Section 2).
- Verify continuity across the switch contact block while the switch is turned to the on position.
- Verify continuity between J9-1 and J9-2 while the switch is enabled.

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## **PERIODIC MAINTENANCE**

Xantrex Technology recommends that the following preventative maintenance be carried out on the PV-30208:

### ***Monthly intervals or as required:***

#### **Aluminum Extrusion Heatsink**

Accumulation of dirt and debris on the aluminum extrusion heatsink and fan shroud will decrease the ability to transfer heat, which can cause the PV-30208 to shutdown on over-temperature alarms. Inspect the aluminum extrusion heatsink and fan shroud for accumulation of dirt and debris. Remove enclosure panels and clean if debris is present.

#### **Fan Operation**

Verify proper operation of the heatsink cooling fan, located within the lower enclosure. The fan operates when the K1 contactor is closed. Remove any debris from the fan and finger guard.

### ***Six month intervals:***

(See Isolation Procedure and perform prior to the following)

#### **Enclosure Seals**

Inspect the enclosure access panel seal. If damaged, replace with equivalent closed cell foam gasket. Call your Xantrex Technology distributor for factory replacements or specifications.

#### **Electrical Connections**

Inspect the condition of all wiring within the PV-30208. Inspect all wire crimps and connections for damage caused from high temperature. Check for corrosion. Replace any damaged wires. Verify all mechanical connections are sufficiently tightened. Verify all conduction surfaces are clean and free of corrosion.

Mechanical electrical connections will loosen over time. This is caused primarily by thermal cycling during normal operation. As connections loosen, electrical impedance will increase at the connection, eventually leading to fire and component damage. It is critical to check all electrical connections every six months.

#### **Enclosure**

Access the enclosure and remove any accumulated dirt and debris. Vacuum enclosure whenever dust or dirt is present.

## **ISOLATION PROCEDURE**

The following procedure should be followed to de-energize the PV-30208 for maintenance:

**WARNING**

**The terminals of the PV input may be energized if the arrays are energized. In addition, allow 5 minutes for all capacitors within the enclosure to discharge after shutting down the PV-30208.**

1. Turn the on/off switch to the off position.
2. Open the PV array disconnect switch (if present).
3. Open the AC disconnect (if present).
4. Open the isolation transformer circuit breaker.
5. Install lockout devices on the isolation transformer circuit breaker and PV disconnect switch.

**TURN-ON PROCEDURE**

Refer to Section 3 for a detailed first-time turn on procedure.

1. Remove any lockout devices from the isolation transformer circuit breaker and PV disconnect switch.
2. Close the isolation transformer circuit breaker.
3. Close the AC disconnect (if present).
4. Close the PV array disconnect switch (if present).
5. Turn the on/off switch to the on position.

After a 15 second initialization period and a 5 minute wake up period, the PV-30208 will automatically begin power tracking, given the PV voltage is greater than the PV start voltage setpoint.

## **DRAWINGS LIST**

151384 : Schematic, System, Grid Tied Inverter, PV-30208

151316 : Envelope Drawing, Grid Tied Inverter, PV-30208

151317 : Assembly, Main Enclosure, Control Components, 30 kVA, PV-30208

151723 : Transformer, 30 kVA, 3-Pole, 60 Hz, 98% Efficient, 208Y/120 or 480Y/277

## **WARRANTY AND CERTIFICATIONS**

Xantrex Inverter Warranty Registration

Underwriters Laboratories Compliance Of Standard UL1741

## **OPTIONAL ACCESSORIES**

For details and specifications on Xantrex Technology 10 and 12 Pole, 600 VDC Combiner Boxes, contact your Xantrex Technology distributor.

For details and specifications on 30 kVA 3-Pole, 208 Delta/208-120 WYE and 480-277 WYE Transformers, contact your Xantrex Technology distributor.



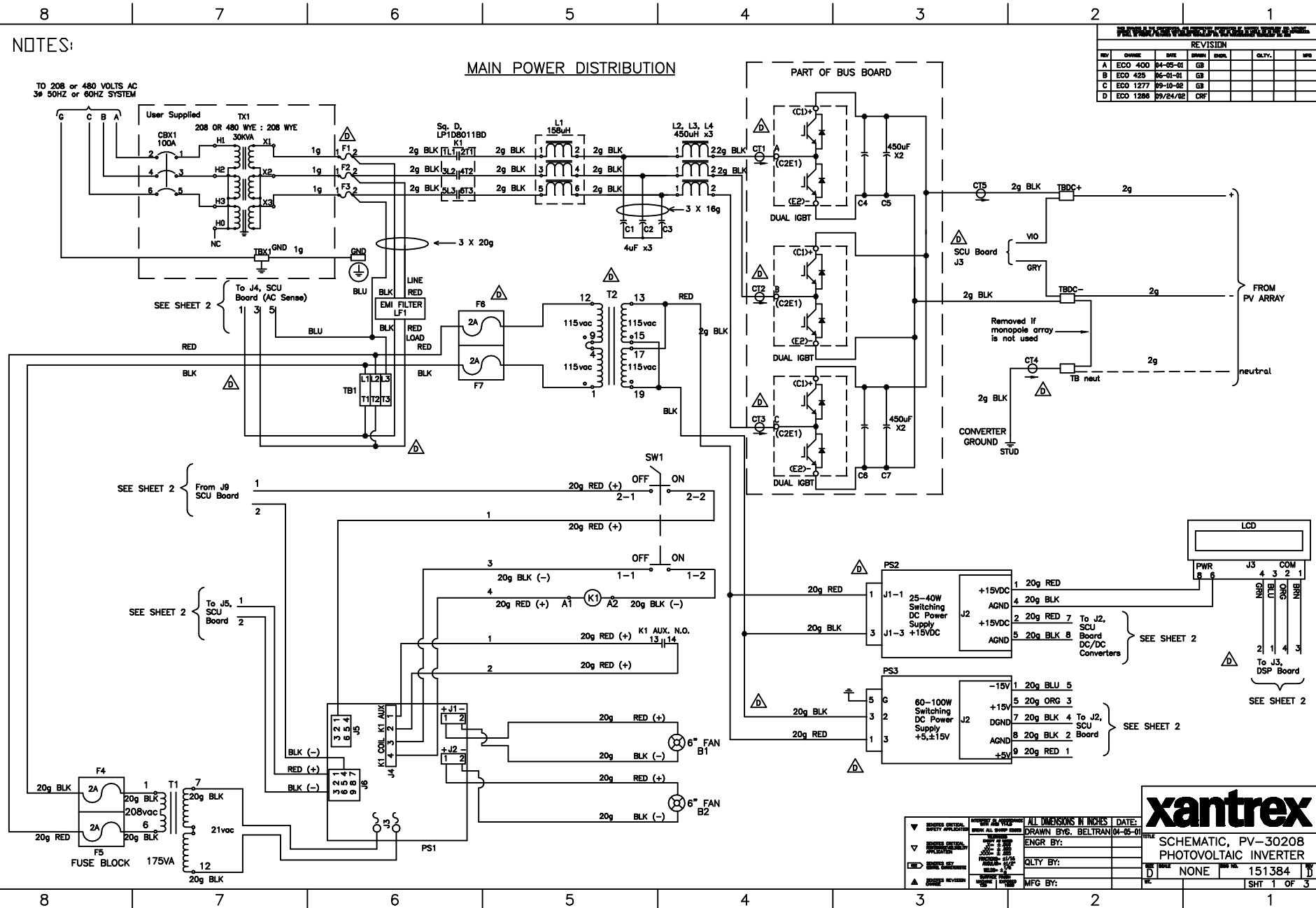
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B	ECO 425	06-01-01	GP			
C	ECO 1277	09-10-02	GP			
D	ECO 1286	09/24/02	GP			

D 151384

C

B

A

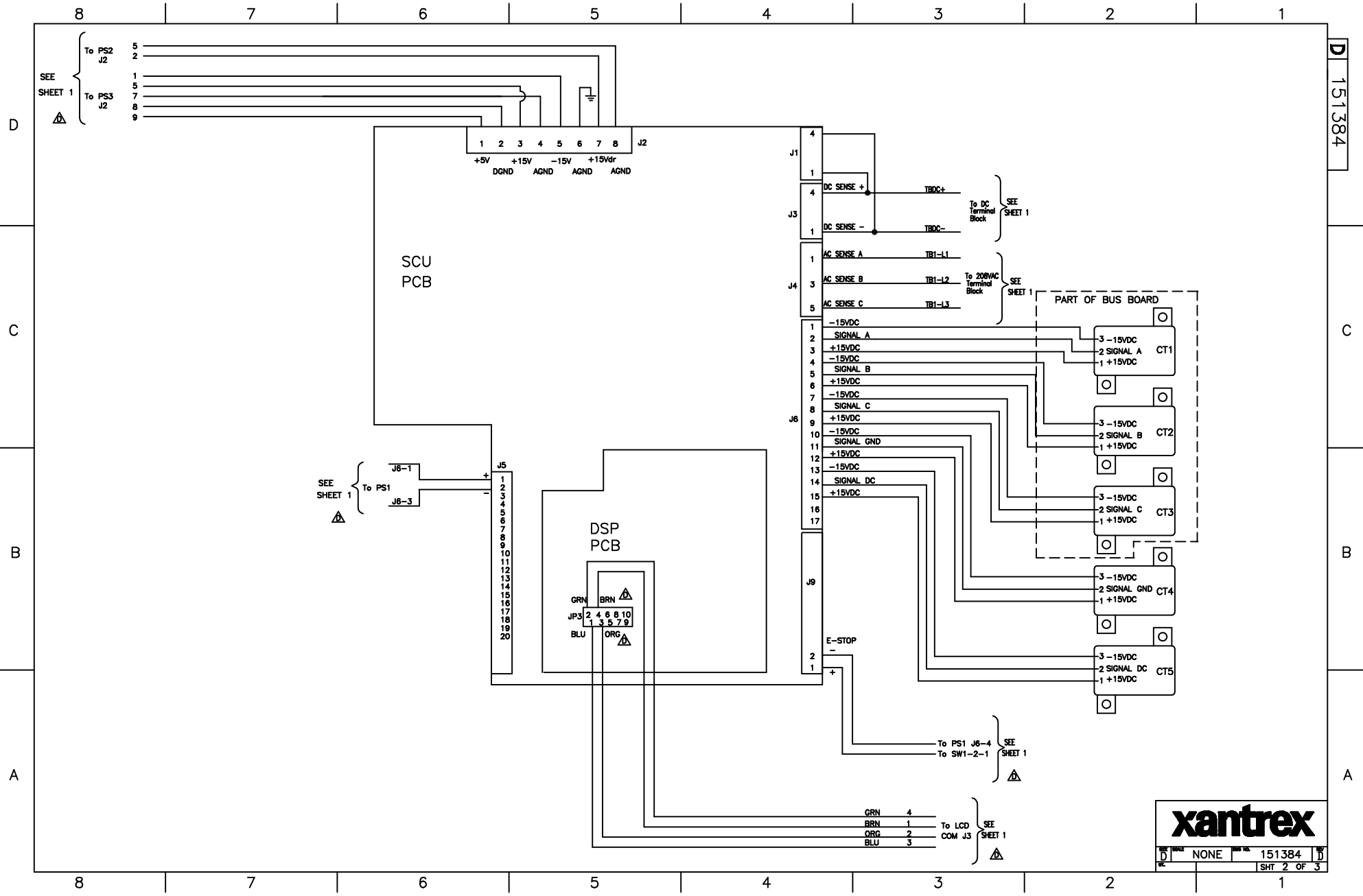


**xantrex**

**SCHMATIC, PV-30208  
 PHOTOVOLTAIC INVERTER**

DATE: 01-05-01  
 DRAWN BY: BELTRAN  
 ENGR BY:  
 QLT BY:  
 MFG BY:

REV: NONE  
 REV NO: 151384  
 SHT 1 OF 3



D 151384

C

B

A

SEE SHEET 1  
 To PS2 J2  
 To PS3 J2

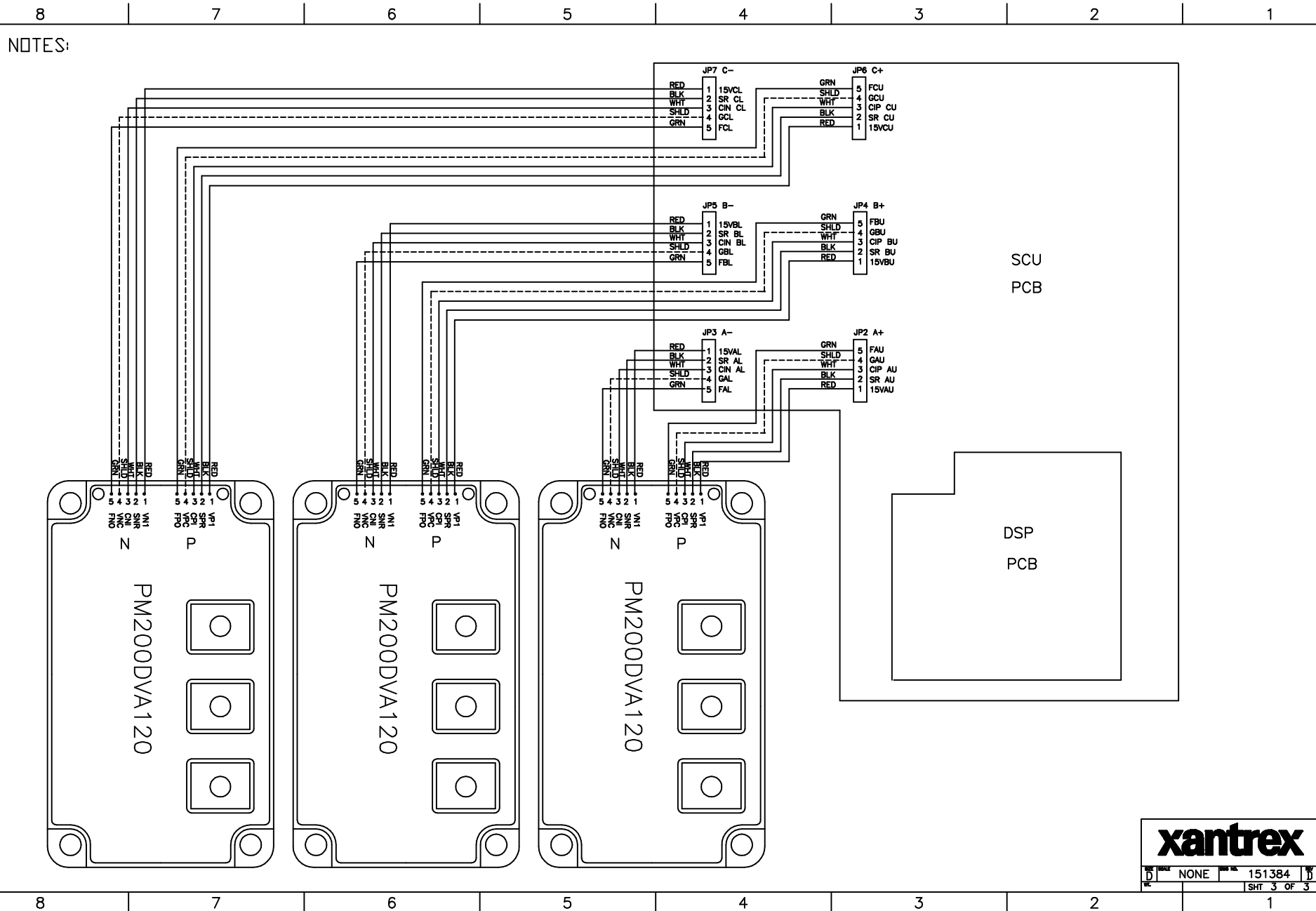
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 To PS1  
 J6-1  
 J6-3

SEE SHEET 1  
 To PS1 J6-4  
 To SW1-2-1

SEE SHEET 1  
 To LCD COM J3

**xantrex**

REV	NONE	REV NO.	151384
DATE		SHT	2 OF 3



NOTES:

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4

3

2

1

NOTES:

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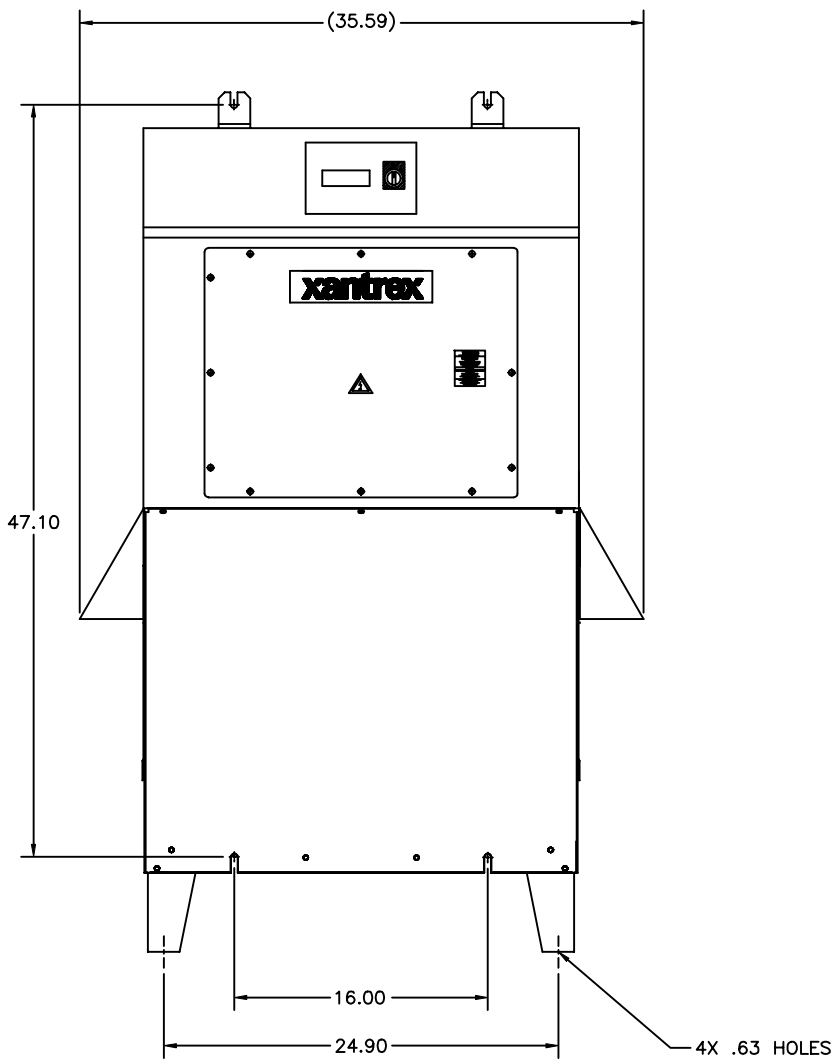
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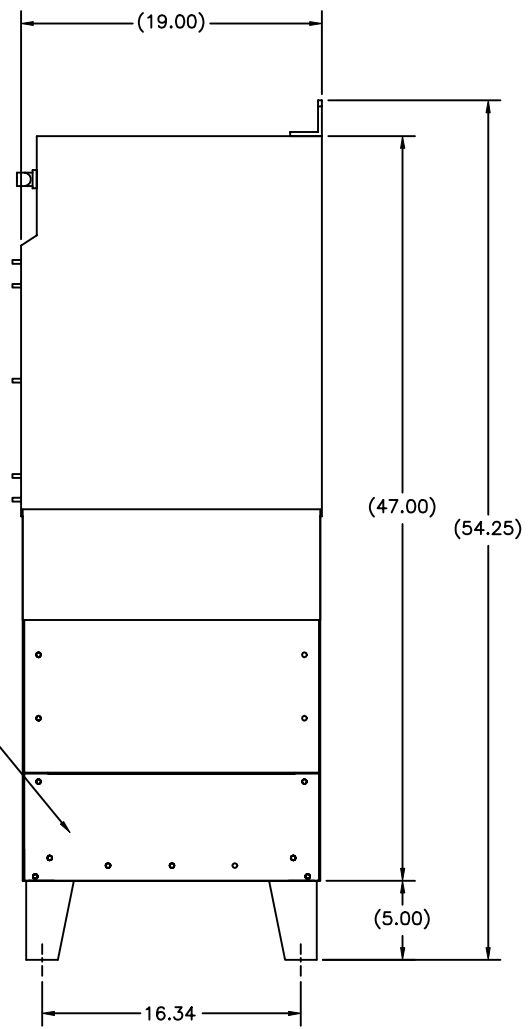
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A



SIDE ACCESS PANEL (BOTH SIDES)



# xantrex

▼ DENOTES CRITICAL SAFETY APPLICATION	INTERPRET IN ACCORDANCE WITH ANSI Y14.5 BREAK ALL SHARP EDGES	ALL DIMENSIONS IN INCHES	DATE: 02-05-01
▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION	TOLERANCES EXCEPT AS NOTED .X = ± .050 .XX = ± .020 .XXX = ± .010 FRACTIONS = ± 1/16 ANGULAR = ± 1/2° WELDS = ± 0	DRAWN: G. BELTRAN	TITLE
⇒ DENOTES KEY CONTROL CHARACTERISTIC	SURFACE FINISH MACHINE 125 EXPOSED 1000	ENGR:	ENVELOPE, GRID TIED INVERTER, PV-30208
▲ DENOTES REVISION CHANGE		Q.LTY:	SIZE C SCALE NONE DWG NO. 151316 REV A
		MFG:	WT. SHT 1 OF 1

4

3

2

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3

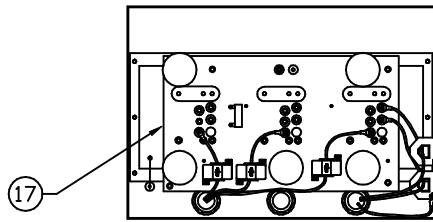
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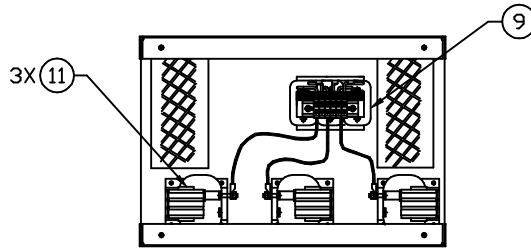
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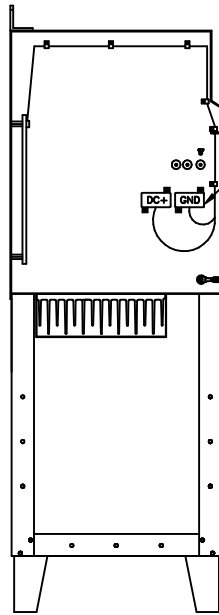
REVISION						
REV	CHANGE	DATE	DRAWN	ENGR.	Q.LTY.	MFG.
A	ECO 524	06-20-02	GB			
B	ECO 1286	10-09-02	GB			



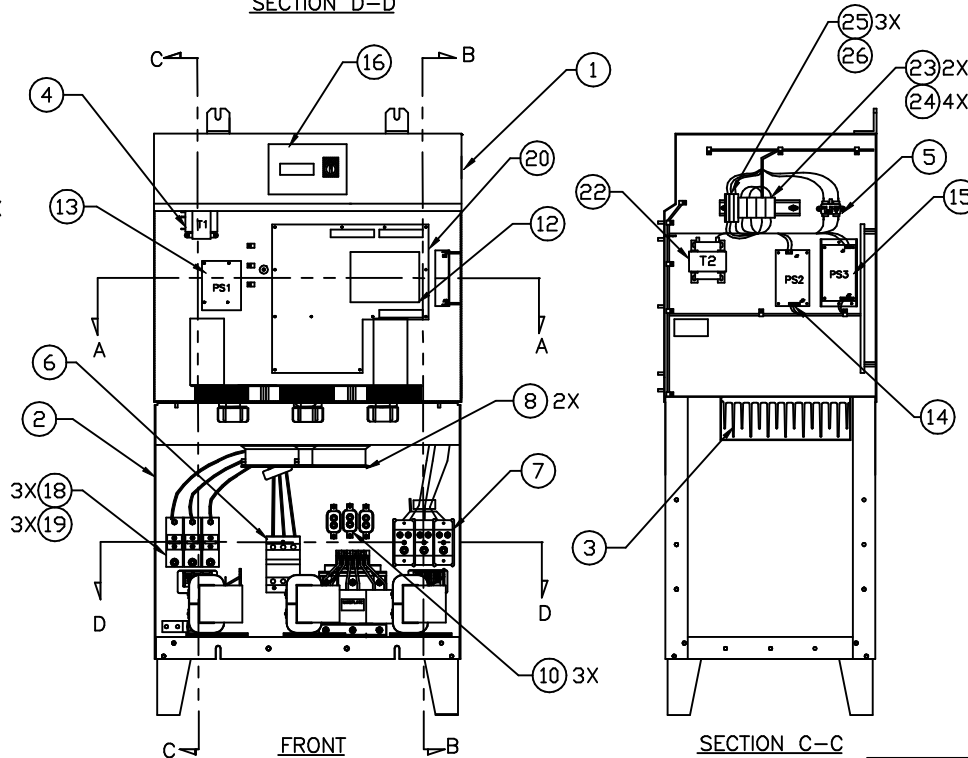
SECTION A-A



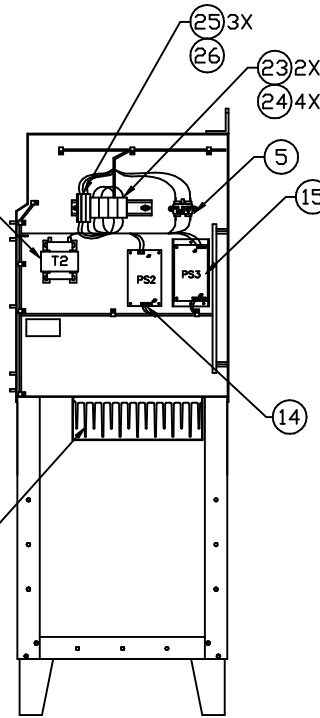
SECTION D-D



SECTION B-B



FRONT



SECTION C-C

D  
C  
B  
A

C  
151317  
C  
B  
A

4

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2

1

▼ DENOTES CRITICAL SAFETY APPLICATION	INTERPRET IN ACCORDANCE WITH ANSI Y14.5 BREAK ALL SHARP EDGES	ALL DIMENSIONS IN INCHES	DATE:
▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION	TOLERANCES EXCEPT AS NOTED X = ± .001 XX = ± .002 XXX = ± .005 FRACTIONS = ± 1/16 ANGLES = ± 1/2° WELDS = ± 1/8"	DRAWN: G. BELTRAN	02-02-01
≡ DENOTES KEY CONTROL CHARACTERISTIC	SURFACE FINISH MACHINE 125 EXPOSED 1000	ENGR:	
▲ DENOTES REVISION CHANGE		Q.LTY:	
		MFG:	

**xantrex**

TITLE: ENCLOSURE, CONTROL COMPONENTS, PV-30208

SIZE: C SCALE: NONE DWG NO.: 151317 REV: B

WT.: SHT 1 OF 2

A

**Xantrex Technology Inc. PV-30208  
Photovoltaic Inverter  
Major Parts List**

**Assembly Description: Main Enclosure, Control Components, PV-30208**

**Xantrex Technology Inc. Assembly # 151317**

Item #	Qty	Reference Designator	Xantrex Technology Part #	Description
1	1	-	1-160070-01	Enclosure, Upper
2	1	-	1-160051-01	Enclosure, Lower
3	1	-	1-160071-01	Assy, Heatsink, PV-30208
4	1	T1	1-160015-01	Transformer, 175VA, 24V
5	1	LF1	1-150684-01	Filter, EMI, 115/250 VAC, 2 Amp
6	1	K1	1-150668-80	Contact, 3P, 24VDC Coil, 80A
7	2	TB1-2	1-160012-01	Block, Power Distribution, Inter, 3P
8	2	B1,B2	1-150714-01	Fan, 24VDC, 6", 240CFM, 53.3dB
9	1	L1	1-150862-01	Reactor, Line, 3 Ph, 158uH, 98 ARMS
10	3	C1-3	1-150403-02	Capacitor, NP, 4uF, 600VAC, 6%
11	3	L2-4	1-160008-01	Reactor, PWM, 1 Ph, 450uH, 83 ARMS
12	1	-	1-150378-02	Assy, PCB, DSP
13	1	PS1	1-160044-01	Assy,PCB, 24VDC, 100W
14	1	PS2	1-160006-01	Power Supply, Single Out, +15VDC
15	1	PS3	1-160030-01	Power Supply, Triple Out, +5, +/-15VDC
16	1	-	1-160052-01	Assy, Panel, Display
17	1	-	1-160049-01	Assy, Bus, 600V, 100A
18	3	F1-F3	1-151719-02	Fuse, 250V, 125A
19	3	-	1-151720-01	Fuse Holder, Semi-Conductor Fuse
20	1	-	1-151565-02	Assy, PCB, SCU-UL, WDM, Tested, 30kW
21	2	CT1,CT5	1-150296-01	CT, Hall Effect, 200A:1mA
22	1	T2	1-151843-01	Transformer, Iso, 230/115:230/115, 200VA
23	2	-	1-160094-01	Fuse Holder, 30A, 600V, 2Pole
24	4	F4-F7	1-160092-01	Fuse, Time Delay, 250VAC
25	3	-	1-151241-01	Terminal Block, 1Pole, 24-8 AWG
26	1	-	1-151242-01	Barrier Block, 24-18 AWG

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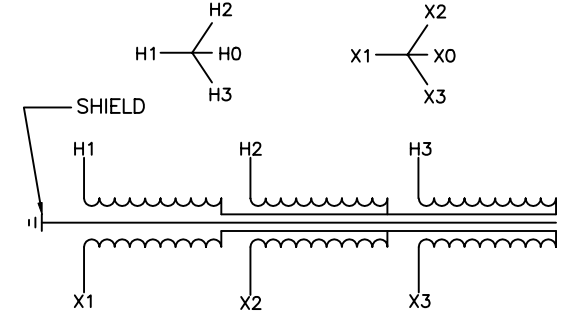
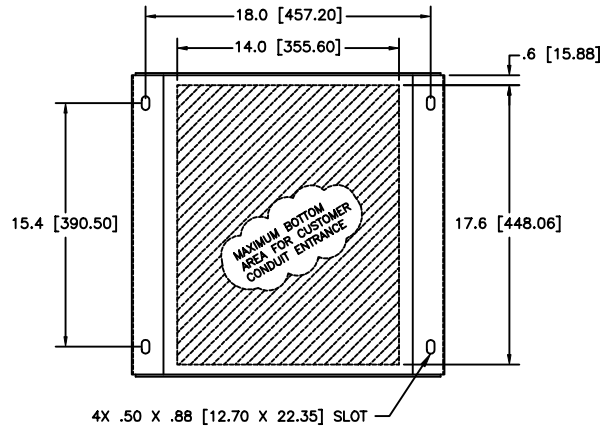
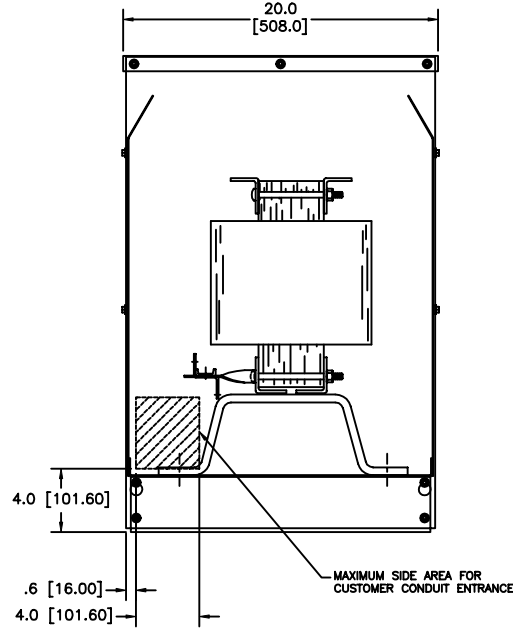
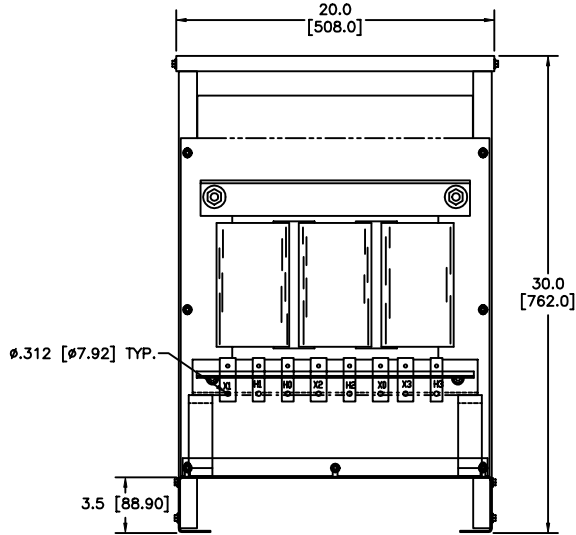
NOTES:

- 1. UL LISTED.
- 2. NEMA 2 VENTILATED ENCLOSURE.
- 3. COPPER WOUND.
- 4. MINIMUM CLEARANCE OF 6" MUST BE MAINTAINED BETWEEN VENT OPENINGS AND OTHER OBSTRUCTIONS.
- 5. USE WEATHERSHIELD CAT WS363 FOR NEMA 3R.
- 6. USE WALL MOUNTING BRACKET CAT WMB363-364.

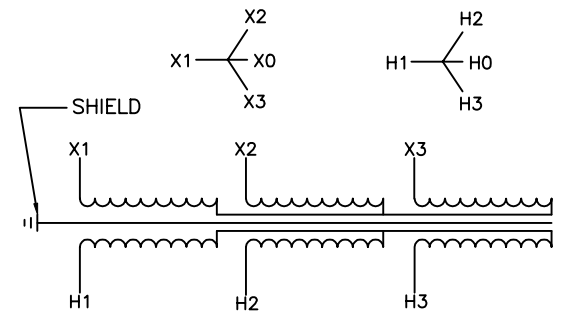
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REVISION						
REV	CHANGE	DATE	DRAWN	ENGR.	Q.LTY.	MFG.
A	ECO 524	05-03-02	GB			

A  
151723



TYPICAL WIRING DIAGRAM #1



TYPICAL WIRING DIAGRAM #2

1-151723-02	XFMR,30kVA,3P,208:480Y/277V
1-151723-01	XFMR,30kVA,3P,208:208Y/120V
PART NUMBER	DESCRIPTION

MFG	MFG'S PART#	VOLTAGE		kVA	CLASS INS.	TEMP. RISE	SOUND LEVEL	AMBIENT	WEIGHT	WIRING DIAGRAM
		PRIMARY	SECONDARY							
SQUARE D	30TQ56366	208 WYE	480Y/277	30	220°C	80°C	45 dB	50°C	390 LBS.	#2
SQUARE D	30TQ56365	208 WYE	208Y/120	30	220°C	80°C	45 dB	50°C	390 LBS.	#1

PRIMARY	208	208
SECONDARY VOLTAGE	208/120	480/277
	CORE	COIL
	CORE	COIL
LOSSES @ 25% LOAD	-	-
LOSSES @ 50% LOAD	-	-
LOSSES @ 75% LOAD	-	-
LOSSES @ 100% LOAD	-	-

▼ DENOTES CRITICAL SAFETY APPLICATION

▽ DENOTES CRITICAL PERFORMANCE/RELIABILITY APPLICATION

⇒ DENOTES KEY CONTROL CHARACTERISTIC

▲ DENOTES REVISION CHANGE

INTERPRET IN ACCORDANCE WITH ANSI Y14.3 BREAK ALL SHARP EDGES

TOLERANCES EXCEPT AS NOTED: .XX = ± .020 .XXX = ± .005 FRACTIONS = ± 1/16 ANGULAR = ± 1/2° WELDS = ± 0

SURFACE FINISH MACHINE | EXPOSED 125 | 1000

ALL DIMENSIONS IN INCHES

DATE: 05-03-02

DRAWN: G. BELTRAN

ENGR:

Q.LTY:

MFG:

**xantrex**

TITLE: XFMR, 30kVA, 3-POLE, 208 PRIMARY

SIZE: A SCALE: NONE DWG NO.: 151723 REV: A

WT. SHT 1 OF 1

C  
B  
A

4

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2

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Smart Choice for Power

Xantrex Technology, Inc.  
Distributed Power Markets  
161G South Vasco Road  
Livermore, CA 94550 USA  
Phone +1 925.245.5400  
Fax +1 925.245.1022

**XANTREX PV SERIES LIMITED WARRANTY AND REGISTRATION**

Xantrex Technology warrants all equipment supplied to Customer under this purchase order against defects in workmanship and material for a period of (12) twelve months from delivery, provided that the equipment has been operated and maintained in accordance with the service manual provided with the equipment. Should Customer give Xantrex written notice of any such defects within the warranty period, and Xantrex’s inspection confirms the existence of such defects, Xantrex shall correct the defects, either by repair or replacement, at its sole option.

For wall-mounted products (generally, below 30 kW in rating), defective products must be returned to Xantrex or its Authorized Service Center in the original or equivalent packaging. The cost of transportation and insurance on items returned for service is at the Customer’s expense. Return transportation and insurance expense shall be borne by Xantrex.

For floor mounted inverter products (generally, 30 kW in rating and above), warranty repairs or replacements are performed at the installation site. Xantrex’s material, labor, freight and travel/living expenses associated with such repair or replacement shall be borne by Xantrex.

In either case, Customer’s labor and travel/living expense shall be borne by Customer. Xantrex will assume no expense, liability or responsibility for repairs made by or for Customer without written authority from Xantrex. Xantrex shall not be responsible for any consequential, incidental or similar damages.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Project Name \_\_\_\_\_  
Customer PO # \_\_\_\_\_  
Inverter Serial # \_\_\_\_\_  
Delivery Date \_\_\_\_\_

Xantrex Authorized Signature:  
  
\_\_\_\_\_  
  
\_\_\_\_\_  
Date

Customer Authorized Signature:  
  
\_\_\_\_\_  
  
\_\_\_\_\_  
Date





333 Pfingsten Road  
Northbrook, Illinois 60062-2096  
United States Country Code (1)  
(847) 272-8800  
FAX No. (847) 272-8129  
<http://www.ul.com>

NOTICE OF AUTHORIZATION TO APPLY THE UL MARK

Northbrook Office

April 30, 2002

Xantrex Technology Inc  
Attn: Mr. Mark DeWolf  
161-G South Vasco Rd  
Livermore, CA 94550

Our Reference: File E199356, Project 01NK33492

Subject: PV-30208 and PV45208 Three Phase Utility Interactive Inverter.

Dear Mr. DeWolf:

We have completed our engineering investigation under the above project number and find the products comply with the applicable requirements.

This letter temporarily supplements the UL Follow-Up Services Inspection Procedure and serves as authorization to apply the UL and C-UL Listing Mark, only at the factory under UL's Follow-Up Service Program, to the above products, which are constructed as described below:

According to the attached addendum.

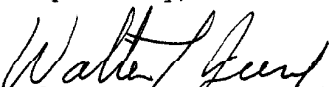
To provide the manufacturer with the intended authorization to use the UL Mark, the addressee must send a copy of this Notice and all attached material to each manufacturing location as currently authorized in the appropriate UL File Procedure.

This authorization is effective for 90 days only from the date of this Notice and only for products at the indicated manufacturing locations. Records covering the product are now being prepared and will be sent to the indicated manufacturing locations in the near future. Please note that Follow-Up Services Procedures are sent to the manufacturers only unless the Applicant specifically requests this document.

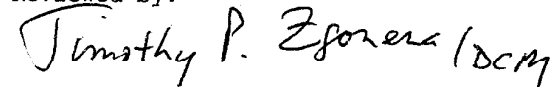
Please note: Within Canada, there are federal and local statutes and regulations requiring the use of bilingual product markings. It is the responsibility of the manufacturer (or distributor) to comply with this law. As such, the markings provided in the UL Follow-Up Service Procedure may include only the English version. Please contact us if you need assistance with translations or in determining which markings are appropriate for your product.

Products produced, which bear the UL Mark, shall be identical to those evaluated by UL and found to comply with UL's requirements. If changes in construction are discovered, authorization to use the UL Mark may be withdrawn and products that bear the UL Mark may have to be revised (in the field or at the manufacturer's facility) to bring them into compliance with UL's requirements.

Respectfully,

  
Walter T. Jurek (Ext. 42834)  
Senior Engineering Associate  
Conformity Assessment Services - 3013MNBK  
E-mail: [Walter.T.Jurek@us.ul.com](mailto:Walter.T.Jurek@us.ul.com)

Reviewed by:

  
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Staff Engineer  
Conformity Assessment Services - 3013MNBK  
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committed to quality service